



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

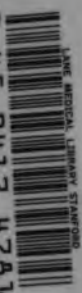
We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

2545 0417 4781



JANE MCDONALD LIBRARY STANFORD

LANE

MEDICAL

LIBRARY

LEVI COOPER LANE FUND

—PRESENTED TO—



The New York Academy of Medicine.

By

The Society of the New York Hospital,

March, 1898.

THIRD ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

LANE LIBRARY

STATE OF NEW HAMPSHIRE

FOR THE

FISCAL YEAR ENDING APRIL 30, 1884.



CONCORD:

PARSONS B. COGSWELL, PUBLIC PRINTER.

1884.

THE LIBRARY

MEMBERS OF THE BOARD.

Gov. SAMUEL W. HALE, ...	Keene.
ATT'Y-GEN. MASON W. TAPPAN, . .	Bradford.
HON. JAMES A. WESTON, ...	Manchester.
GRANVILLE P. CONN, M.D., <i>President</i> , .	Concord.
CARL H. HORSCH, M.D., ...	Dover.
IRVING A. WATSON, M.D., <i>Secretary</i> , .	Concord.

PREFATORY NOTE.

It should be understood that this report is not made for the purpose of contributing to the scientific knowledge of the day, but rather to present some important truths and facts to the people of our state relative to matters of vital interest to them. Complex questions on the pathology of disease, theories which outreach the border-land of facts, and expert investigations which require the highest professional or scientific training to comprehend, have their legitimate place; but they are outside of a publication designed for all classes of persons. We have endeavored, in the following report, to present all the subjects taken up in such plain language that they will be understood by all, believing that by so doing we shall better accomplish the true design of this board, and render a better service to the whole people of the state.

I. A. W.

GENERAL REPORT.

To His Excellency the Governor and the Honorable Council:

The third annual report of the State Board of Health is herewith presented. The work of the year has been exceedingly gratifying to the board, because its results have been marked with an emphasis that has demonstrated its usefulness, not alone through the amount of executive work performed, but by the undoubted progress in sanitary directions through the principles and precepts that have been given to the public. It is fair to assume that these results are in part the legitimate products of the labor that covers the whole period of our organization: indeed, had not the seed sown in the earlier existence of the board, as well as the later, germinated and shown evidence of growth, the encouragements for future work in this too little appreciated field would be infinitesimally small. The field in which we are at work, as well as the labor performed, must of necessity be vastly different from that of a local health officer whose work is largely executive. His mission is generally one of immediate necessity,—to remove some existing cause of disease, to assert quarantine and effectually hold a dangerous contagious disease where he finds it, to heed the complaints of his townsmen on matters bearing on the subject of public health,—in fact, to use every endeavor which comes to his knowledge to prevent ill-health in the community to which he is officially responsible. While we recognize all this as a part of the duties which we are conscientiously and legally bound to perform, we believe that the greatest and best results are to be accomplished by educating the people so that they will be better prepared to avoid some of the endless dangers that surround them. It is

the evidence that much good has already come from such a course that inspires us with a great hope for grander results in the future. The growing appreciation of such work by the people of the state has been made evident in several ways. First, by the great number of inquiries that have come to us from many sections of the state regarding the cause of sickness, and seeking to obtain some information as to the relations of local conditions to disease. The fact that local conditions, for which families themselves are responsible, bear an intimate relation to the health of the family has become pretty generally known in the abstract; hence the many interrogatories that have reached us asking for information of a specific character in individual cases. Second, an increased interest and thoughtfulness in the *prevention* of disease, and more widespread solicitude to maintain good health by means calculated to give no foothold to certain diseases, exhibit a progress of the most salutary kind. The influences which come from such forethought are educational in themselves: one individual, who intelligently and methodically keeps his premises in a good sanitary condition, gives a healthier atmosphere, in more senses than one, to the community in which he lives. These advances have been noticed by the board with much pride and gratification. Third, the marked progress that is being made through corporate influence and executive sanitary work, as evidenced by the action of our cities and towns. New local boards of health have been created, old ones have received a new impetus, and awakened from the lethargic state no better than death; new regulations have been instituted, based upon a more intelligent understanding of sanitary requirements, and their observance has been better heeded through the growing knowledge of the people upon such subjects. Fourth, by reason of the broader and more enlightened views taken by the legislature of the state. This must of necessity have been brought about largely through confidence in the board, and an appreciation of the work performed during the first two years of its existence. It is also probable that the unquestionable progress and the humane results that have been accomplished by older boards in other states have not been overlooked, and have contributed much to place sanitary science upon a higher plane in our own state. These and many other

facts have led us to believe that the people, to an unexpected extent, considering the length of time, are giving their endorsement and approbation to a work which we trust is as yet only begun. We recognize the fact that without the hearty coöperation of the public much that has been achieved would have remained undone: hence with pleasure and pride we acknowledge the services of other hands in this unlimited field of usefulness.

PROGRESS IN SANITARY SCIENCE.

No progress has been more marked, in the arts, sciences, or industries that bear upon civilized life, than that which has characterized the advance of means and knowledge to save human life; indeed, the present generation has witnessed a revolution in old methods and theories as to the best way of handling many of our most fatal diseases. Statistics which carry with them the proof of correctness astonish us with the results already attained. The movement is not confined to any country within the pale of civilization, although the advance has not been uniform under all governments. The English and the German had made the attack almost before we, as a nation, were aware that there was a vulnerable enemy among us. It was not thought that the phalanx of disease could be broken, until pioneers in the field had made large openings in its insidious and silent ranks. Jenner was the boldest of all the scouts, and he led the way of humanity through a wonderful physical metamorphosis up to the rendezvous of safety from that once withering and victorious disease, small-pox. His genius gave to man a sceptre of power over the most loathsome and hideous of diseases, that has saved tens of thousands from an early grave, and more from unsightly disfigurements. The demoralizing epidemics of the past, so terrible that families deserted their own sick ones, and even cities and towns were left to the possession of only the dead and dying, counted as they sometimes were by the hundreds, is only known in history. Vaccination brought a new era to mankind. "The saving of life by vaccination every year is equal to one tenth of the standing armies of Europe. In Mexico, three and a half millions perished by one visitation of this fell disease. If one hundredth part of this number should

now die in any nation by a single epidemic, the world would stand aghast in horror." *

From the time of Jenner's triumphant discovery to the present generation, there is no marked epoch in the history of preventive medicine. In later years the advancement in medical science and the more general spread of popular education weakened the deep-rooted superstition that disease was born of the wrath of God and nursed through planetary influence, and turned the minds of thinking men into the prolific channel of investigation. Rational causes were sought to explain that which had hitherto been shrouded in the wrap of delusion and canopied by ignorance. A new philosophy was developed out of the chaotic *débris* of disrupted legends, transmitted fallacies of faith, the cherished conclusions of the illiterate, as well as the formulated opinions of the educated. The process of disintegration, of unloading the mind of its cumbersome accumulation of error, turned the advanced thought of the time into seeking the causes of disease through the operations of natural law. So marked has been the result, that we might well be filled with wonder: indeed, the mind can scarcely contemplate its accomplishments. No such epidemics as terrorized the past can today march over a large area of civilization; no contagion can lay its hand upon a whole continent. The great torrents of death have been occluded, so that only here and there are insidious streams falling where cataracts once inundated, and civilization rests in a physical security hitherto unknown to history. In this country the progress of the last ten years in sanitary education has been unprecedented, and has resulted in the saving of thousands of lives. This is not an assertion based upon an imaginative hope, but it is substantiated by statistics. The mortality rates of many of our towns and cities have been reduced very largely by sanitary means, and diseases that for years brought an annual harvest of death, have, in some localities, been nearly eradicated. These are some of the evidences that man has, in a large degree, the mastery over disease. Sanitary work in this country has been chiefly accomplished by the various state boards of health. These have received encouragement and strength through such beneficent organizations as the

*Dr. Kedzie, of Michigan.

American Public Health Association and the National Board of Health, and have in turn largely directed the work in their respective states. Local health boards and health officers have been established in many of the towns, and a direction and stamina given to the work that otherwise would not have been felt. This, with the general information that has been diffused by the state boards, has wrought an influence and accomplished a result the worth of which cannot be computed in dollars. These organizations are increasing every year. To-day there are but few states which have no health department, and these will undoubtedly soon take up the work that has already proved such a blessing to the more, in this respect, progressive states. Recent discoveries in the influence of certain diseases have placed the work of health organizations upon a plane far above empiricism or speculation, and indicate definite lines to follow, that formerly were unrecognized. The germ theory of disease, first successfully promulgated by Pasteur, Koch, and others, and corroborated by numerous workers in the same field, has already done much in the interest of sanitation, yet not more, perhaps, in the positive discovery of the germs of a few diseases, than in placing before the perception something tangible to be dealt with. If certain individual tribes of the great family of bacteria are the sources of some of our most fatal diseases, and their favorite *habitat* a soil wherever filth abounds, like sewers, sink-drains, foul cellars, vaults, etc., then we see a rational explanation for these diseases, which never occurred to us from any other standpoint or prior knowledge. If in every sewer, and around and in every heap of filth and decaying refuse, these very minute microscopic germs exist as thick as swarming bees about a hive, and experiments have demonstrated this, we behold the danger in a more vivid light than before, and have a better knowledge of the means of defence. These discoveries, though of recent date, have already been of incalculable value in the prosecution of sanitary work, because they have given a definite idea of certain conditions and dangers that before were not rationally explained. When a person intelligently understands that in his living- and sleeping-rooms he is breathing an atmosphere charged with these germs, and daily jeopardizing his health, simply because the drain-pipe from his sink is

untrapped, he will not be likely to longer tolerate the danger. It is the general diffusion of such knowledge that leads to the protection of the family, and it is by such knowledge that so much has already been accomplished.

LESSONS OF EXPERIENCE AND OBSERVATION.

The proofs that have given hygiene the dignity of a science are as convincing, in many directions, as it is possible to find in the domain of rational evidence. This proposition is so generally accepted, that it has become an important consideration in the complex trades and industries of business life, outstripping the boundaries of expediency, going beyond the requirements of law, and becoming a recognized integer in the question of economy and finance.

When the members of several families are taken almost simultaneously with typhoid fever, and it is found that they all get their drinking-water from one well, and upon examination of that it is found to be badly polluted, the inference is that the cause of the disease has been discovered. When seventeen per cent. of the population of a town are suddenly stricken with typhoid, and it is found that the drainage from a distant farmhouse where there was typhoid fever had made its way into the spring of water that supplied this town, any sane mind will recognize the cause. Such evidences of the propagation of the disease are numerous, and should lead thinking men and women to study the conditions and relations that surround them.

The occurrence of malignant diphtheria in a family of five children with four of the cases fatal, when the disease did not exist elsewhere in the town, and the discovery of the vilest kind of a cesspool extending under all the living rooms of the house, receiving constantly all the sink water and the waste of the household, presents a lesson too terrible to be forgotten.

When a family becomes sick with a disease resembling typhoid fever, and one of the members dies by reason of a cesspool or vault poisoning the well with its death-dealing contents, it is a lesson that the whole community should no sooner forget than the grief-burdened ones of that broken household.* These are some of the sad experiences, the costly lessons, that are educat-

* See report on Little Boar's Head.

ing the public mind to the dangers of filth. It is a terribly expensive system of education that takes human life, often the tenderest and the dearest, to prove the problem that has been demonstrated year after year in the same reckless manner. While we lament such an unnecessary loss of life, we have great reason to rejoice in the progress that has been and is being made in the reduction of the death rate from preventable causes. The history of small-pox illustrates the most wonderful accomplishment in the direction of preventive medicine through the beneficent discovery of vaccination. Basing the calculation upon the mortality of this disease before the discovery of vaccination, an annual saving of from 50,000 to 100,000 lives is now secured from this one disgusting and exceedingly fatal disease.

The recent outbreak of typhus fever in New York city has well shown the efficiency of a health department, and the control that an organized effort has over disease. It was limited and entirely stamped out with a loss of less than three hundred lives. Had it prevailed in the same ratio as the last preceding epidemic, in which there were four thousand deaths, its fatality would have exceeded ten thousand. This reduction, and consequent great saving of life, was brought about wholly by reason of a better knowledge of the means required to successfully handle an infectious and contagious disease, for it had got a foothold in tenement- and boarding-houses that rendered it a formidable enemy.

When the death rate of a city or town, which has been so high as to render it one of the unhealthiest, is, through the agency of draining, sewerage, clearing up, securing a good water-supply, and teaching the people the elementary principles of hygiene, made one of the healthiest, and its mortality rate largely reduced, the evidence of sanitary progress is written so plainly that all may read.

PHYSIOLOGY AND HYGIENE IN OUR COMMON SCHOOLS.

The last legislature enacted several important laws relating to the public health, which will be found in the appendix. Any law that bears an intimate relation to education or morals is a sanitary measure, because the highest grade of sanitary accomplishments cannot be reached without both. Filth and morality

are no more associates than fire and water; in the individual, one will extinguish the other. A clean mind, an intellectual culture in moral refinement, and a mental range broad as the instincts of humanity, can never be found in the person who does not cultivate and practise the strictest habits of cleanliness; neither can a healthy physical organization be maintained in this age, differing so radically in its environments from the past, without some observance of the principles of hygiene.

This principle was recognized and creditably acted upon by the last legislature. The passage of a law requiring physiology and hygiene to be taught in our common schools, with special reference to the effects of stimulants and narcotics, was a great step in the right direction. The results ought to placard the highways of life with notices of its unsafe bridges and dangerous crossings, and give to the traveller a guide where before his surety of making the trip depended largely upon his good fortune. He may, however, with all the knowledge he can receive, meet with some of these dangers: but who will dare say that his chances are not infinitely better by reason of the knowledge? Let it be understood that knowledge cannot be legislated. The act of creating a law simply builds the machine with which disciplined minds and skilled hands are to produce the results: so this law, if properly cared for and looked after, will no doubt accomplish a great and valuable work throughout the state, the greatest benefit of which will be felt by the generations to come. It is far more important to teach children those principles upon which their success in life rests, than to waste their time and vitality upon problematical questions designed for mental discipline. The pale and enervated school-girl, who is exhausting her small stock of nerve force and physical strength struggling with the problem of extracting the square root from some complex algebraic polynomial, ought either to study physiology and hygiene, or to be placed in the care of a guardian who has a good stock of common-sense. Conservation of force, and a harmonious and equable balance between the many functions that constitute life, as well as the external requirements necessary to maintain good health, ought to be one of the primary studies of our common schools. To teach children the dangers

that result from certain habits, to warn them against pernicious practices, and to instruct them in the methods of maintaining physical health to its completement, basing all this instruction upon scientific facts, cannot fail to be of incalculable benefit to them and to coming generations.

The results, however, of this law are dependent very largely upon the methods and means of executing it. First, the teacher should be qualified to teach the subject. The listening to a recitation, and being able to tell the pupil whether the lesson has been correctly given or not, is not teaching; it is a school-room farce, and will accomplish practically nothing. Teachers should at once (if they have not already done so) take up these important subjects, and study them carefully and thoroughly. They should go far beyond the elementary works of the common school, especially upon hygiene, taking up some of the more comprehensive publications of a standard character, thus fitting themselves to become teachers in the true sense of the term.

Second, assuming that many of the so-called teachers, who work for a mere pittance in some of our small common schools, will have no better prepared themselves upon these subjects than upon many others, it becomes a matter of great importance that a suitable text-book be selected, as the most information the pupil will receive under such circumstances must be directly from the book. This is a matter to which the attention of the superintending school committees is earnestly called. The business energy of many publishing houses will urge upon him the especial merits of such and such a work, declaring that it is unequalled, and presenting an array of testimonials to prove the assertion that to some might seem conclusive. One ambitious publisher has already sent sample copies of his work broadcast throughout the state, and in a few instances has secured its adoption. Yet the work is full of errors, and ought not to find a place in any school. Committees need make no haste in the selection of a text-book. A similar law to ours has been passed in Vermont, in New York, and in Michigan, with a reasonable prospect of its adoption in other states. Several creditable authors are now at work upon a text-book intended to fulfil the requirements of the law, so that in a few months at most it is probable

several good works will be issued, thus giving the committees a larger field from which to make their selections. Again: the committee should not select a work wholly upon his own judgment, unless he has had a professional education in these branches. He should consult medical men, or teachers who are competent to give him advice before making his selection. This is a very important matter, and it is hoped that the school authorities of every city and town in the state will give it due consideration.

THE REGISTRATION LAW.

A new law was enacted at the last session of the legislature for the purpose of securing a better registration of births, marriages, and deaths. The failure of the old law to secure accurate records had long been apparent, and a demand for a better system came from several sources. Important evidence, resting upon the record of a birth, marriage, or death, was oftentimes lacking in the various departments of law and justice; widows rightfully deserving pensions have often failed to obtain them, because no record of the marriage could be found; property sometimes failed to be transmitted in its rightful channels, because such records of births or deaths were wanting. In many instances valuable links in the chain of evidence were missing, through the deficiency in the records of vital statistics. Hence the readiness with which the legislators of our state sought to remedy the defective law. The present law went into operation January 1, 1884, and thus far but few complaints have been received regarding its operation, and those were mostly because it was not fully understood. Its provisions are simple, and can be carried out by all, if done in a systematic manner, without any particular trouble or inconvenience. If this is done, the result will be a more correct record than we have had in the past. A similar law is in force in several of the states, and in most of the large cities of this country, and is the only method that has secured anything approximating accuracy of returns. It is intended to make this law an active one, and its violations will not be passed unnoticed. We desire all who have any part in its execution to do their duty, and thereby secure such records as will be invaluable to every town and city in the state.

INSPECTION OF MILK.

Another important law passed at the last session was that relating to the inspection of milk in such towns and cities as adopted the provisions of the law, and appointed inspectors. This enactment was brought about largely through the efforts of the city of Manchester, by persons who suspected that milk of an inferior quality was being offered for sale in the markets of that city. Immediately after the passage of the law the city appointed its inspectors, and the result has been, we are credibly informed, that several guilty parties have been discovered, and a stop put to their practices. While it may not be feasible or necessary for the smaller towns in the state to adopt this law, it is a matter of much importance to the larger towns and cities. The law is not intended in any way to reach those who are disposing of good milk of a standard quality, but is designed to keep out of the market milk which is watered and otherwise rendered inferior in quality. Thus the law is a protective one to those who are honestly and legitimately supplying the people with an indispensable article of food.

ZYMOTIC DISEASES.

The reports which have been forwarded to the secretary from different parts of the state by physicians, and which are to be found in his report, are replete with information of the most valuable character. Neither typhoid fever, diphtheria, nor scarlet fever has prevailed to an unusual extent. No epidemics of these diseases have existed during the year. In some localities scarlet fever has prevailed to quite an extent, but it has been mild in form, and has produced no general alarm. The value of the reports given is in the amount of sanitary information that they impart. The association of bad sanitary conditions with typhoid fever and diphtheria is very noticeable, and cannot fail to impress the reader with the fact that filth in some form is essential to the existence of these two diseases. The relation of scarlet fever to filth does not seem to be so close. The latter disease is doubtless greatly dependent upon personal idiosyncrasies, propagated principally by contagion, and is not a filth disease *per se*. Nevertheless, like all other diseases, bad

sanitary surroundings contribute to its severity. Twenty years ago it would have been presumption to have looked to the immediate conditions and surroundings of the household for the causes of typhoid fever and diphtheria. To-day such is the accepted belief, because observation has brought conclusive proof that these diseases do not exist without unsanitary soil, in which its poison is preserved and propagated. Filthy sink drains, foul cellars, neglected vaults, and a score of other conditions of the same class, if not the soul and body of these diseases, furnish them with their destructive weapons. Filth and perfect health are incompatible, because the former is either boldly or insidiously infringing upon those means which support the latter at its minimum. Cleanliness is always a preventable measure against sickness. There is no disease but that makes greater inroads upon the system where filth exists. While scarlet fever, measles, and whooping cough are not dependent upon the same conditions for existence as typhoid fever, diphtheria, dysentery, and cholera infantum, yet the severity of the former may be greatly increased by the same causes that give support to the latter class.

It is believed that much has already been accomplished in our state to reduce the fatality of many zymotic diseases, through sanitary improvements. A degree of knowledge upon these matters exists to-day greater than ever before, and has been brought about by the general diffusion of sanitary information through various channels, and through special work since the organization of the State Board of Health. This knowledge ought yearly to be increased, until the sickness and mortality rates from the diseases named shall be represented by figures much smaller than are now required. That such a result will sometime be achieved is not unreasonable to expect.

WATER POLLUTION.

During the past year considerable attention has been given the subject of impure drinking-water, the result of which will be given somewhat in detail in the report of the secretary. The analyses which have been made show conclusively that the dangers resulting from impure water are very great, and that contaminated water is found where least expected, especially in

wells. The amount of ill health caused directly by contaminated water is much greater than is generally supposed. People are slow to believe that the well from which they obtain water is polluted, because it tastes sweet, looks clear, etc. The evidences, which are shown farther on, answer these points with substantial and convincing proof. The investigation of the past year leads us to believe that this source of sickness and ill health is greatly overlooked throughout the state, and that much more attention should be given the subject by those who rely upon wells for their water supply. A few instances of lead poisoning are also given by the secretary in his report upon water pollution, which should serve as a warning to those who are using water that is received through lead pipes. The extent to which lead pipes become a source of danger is dependent largely upon the quality of the water, some waters attacking lead much more readily and rapidly than others. This, however, can only be determined upon a careful analysis. As this is very seldom done, all waters that come through lead pipes should be looked upon with suspicion until the proof is established that they are not dangerous. The report presents some other strong evidence on the subject of impure water, and should be carefully read by all who desire to protect themselves and their families against the dangers that arise from this source.

INSPECTION OF PUBLIC AND CHARITABLE INSTITUTIONS.

The inspection of public buildings and almshouses throughout the state has shown that many of the earlier suggestions of the board to these institutions have been faithfully carried out, so that in many of them the sanitary conditions have been greatly improved. The advice which has been given has generally not only been courteously received, but heartily welcomed by these institutions, and the executive authorities of the same have, in most instances, made every effort within their power to carry out these suggestions. While all that is desired in this respect has not yet been accomplished, the progress that has been made is highly gratifying. In some instances a policy has been maintained far too narrow for the best interests of certain institutions. An institution that is not only out of debt, but has a large fund in its treasury, should not maintain a miserly policy,

which is detrimental not only to the comforts but to the health of its wards. It is gratifying to remark that such a condition of things is the exception in our state. The liberality which most of the counties exhibit towards their almshouses, and most institutions of a public or charitable nature which are governed by boards of trustees, is ample for all the wants of such institutions. The detailed report of the secretary upon individual institutions will more fully review this subject.

PAPERS PRESENTED.

A few papers have been included in this report on subjects of special importance to the people of the state. The authors are men competent fully to discuss the subjects upon which they have written, and the advice given comes from experience rather than from theory. They are also presented in language as thoroughly divested of technicalities as possible, that the matter may be understood by any person who reads it. We believe they will be read with great profit.

SECRETARY'S REPORT.

The secretary's report embraces very much of the executive work of the board for the year, and also discusses various subjects of interest to the people. The report on water pollution will doubtless be read with interest, and ought to receive the consideration of every one.

The reports upon the zymotic diseases, received through the physicians, are strong lessons on the importance of good sanitation. Many cases of minor importance with which the secretary has had to deal during the year have been omitted, in order to give room for material of a more valuable nature. The details of executive work in many cases would be of no value in a report, consequently they are omitted. We recommend a careful and candid consideration of the various subjects presented.

SECRETARY'S REPORT.

Three years of experience, resulting from a close and constant labor in this field, has proven to our mind that reforms must, from their very nature, be of slow growth. A hearty and substantial progress in any of the arts or sciences which bear directly upon the habits and customs of life, is like the moulding of a shapeless mass of granite into the beautiful shaft. It is the successive blows, the patience, the skill, the care, and, above all, the knowledge of what is desired, that brings forth the finished product: so in sanitary work it is the slow but constant training of the public mind, the educating the people upon those subjects that bear so close a relation to our health, pointing out the dangers in a logical way, showing the results of inattention to established laws, in often bringing the whole subject within the comprehensive grasp of the family, that the best and most lasting results are accomplished. Education will cure more evils than the halter, and school-houses are better defenders of life and property than jails: so the whole subject of sanitation will be augmented, the health of the people made more secure, and sickness and death resulting from certain causes more rapidly reduced, by instructive methods than by the executive work alone of all the boards of health ever created. The work already accomplished by these means is of a very gratifying nature, and is manifest in all sections of the state. In this the board has a right to feel that it has done and is still doing a great and valuable work, compared with which the occasional abatement of a nuisance is but the merest trifle. The people are thoroughly interested in the work so auspiciously begun, and the evidence that it has taken root in all sections is of the most convincing character to those engaged in the work.



The great number of inquiries, much exceeding the previous year, that have been received, asking for information upon special sanitary subjects, the larger number of cases that have come to the board through local boards, the creation of town boards of health in towns that never before had such an organization, the lessened tolerance among the people of nuisances that trespass upon private rights, increased funds appropriated by towns and cities to protect the health of their people, and a greater interest generally among all classes in sanitary matters, are a few of the strong proofs of progress. A community that gives close attention to personal cleanliness and domestic sanitation is a cultured, refined, and moral community. Morality is slow to be absorbed by a dirty skin, and refinement keeps out of slovenly dwellings. The effect of a good hygienic administration in a town or city reaches far beyond the domain of physical life. It is incompatible with ignorance and moral obliquity, and helps to rear, upon a better physical foundation, the supremest qualities of manhood and womanhood.

The work done within the past year has been, to some extent, discussed in the general report, but there remains much to be specifically examined in order to fully understand the import of some of those subjects which in the report mentioned have been only briefly reviewed. The reports from the physicians which follow, on the principal zymotic diseases, are exceedingly valuable, and should be carefully read. The discussion of the question of water pollution ought to be read by every family that is dependent upon a well for its supply of water. Other questions of importance will receive attention in their proper place.

TYPHOID FEVER.

If there is anything of weight in the testimony of close observers and careful investigators, then the evidence is overwhelming that typhoid fever is a filth disease. The many individual reports that are here presented, gathered from all sections of the state, reveal a remarkable unanimity of opinion upon this loathsome and exceedingly fatal disease. So general is the

belief that filth in some form is necessary to support this disease, that its very name suggests uncleanness, defective sewerage, bad drainage, foul vaults and cellars, filthy sink-drains, contaminated drinking-water, etc., etc.

It is not probable that all the cases classed under this head are true typhoid. There are undoubtedly cases of systemic poisoning by inhalation of foul air, or by drinking polluted water, that so closely resemble typhoid as to render it quite impossible to determine the difference when the pathognomonic symptoms are absent. Some writers have suggested that this be called "cesspool fever." This is a question of diagnosis and nosology: it matters but little to the public how this is settled, since it would not affect the death-rate. The cases arising from the poisoned well at Little Boar's Head seem to illustrate a typical case of what might be called cesspool fever, since it is very probable that the cases were not typhoid, though so closely resembling the same as to ordinarily pass for that disease. If this distinction is true, then it is much easier to account for the sporadic cases of so-called typhoid in localities where it had not previously existed. This fact has been proven, that if filth alone is not sufficient to produce typhoid fever, it begets a diseased condition so similar that its difference cannot always be distinguished.

It is probable that many cases reported as typhoid fever are cases of filth disease arising from a variety of unsanitary conditions. True typhoid is undoubtedly propagated by a specific germ or poison. Prof. Lindsley, of Yale college, concisely states the more recent views on typhoid, as follows:

"As the typhoid fever is now understood, these are the conditions under which it is propagated: It is not directly communicable from the sick patient to another person, but the sick patient eliminates from his person, chiefly through excreta, the specific germ which gives the disease. This disease germ is not at once infectious, but, like seed cast upon stony ground, will perish if not placed in conditions favorable for its development into an active state. The conditions favorable to such development are those most similar to the conditions in which it exists, namely, in the presence of human excrement. If, then, the dejections from a typhoid fever patient are thrown into a vault,

the germs of disease which they contain will not only be fully developed, but they also possess the power of reproduction, and so may be multiplied to an indefinite extent. But fecal matter is not the only soil in which they flourish. Any mass of decomposing organic matter seems to be equally favorable to their development and propagation when they are implanted in it, so that cess-pools, filthy drains, and filth in any form afford a fertile soil for the reproduction of the typhoid fever germs. Hence it follows that privy-vaults, cesspools, and filthy drains become centres of contagion, and dangerous localities when typhoid fever is prevalent. The danger from them is vastly increased, because the fluid portions of their contents, charged with these fever germs, permeate the soil, and are carried by the underground water-current to neighboring wells, which they poison. Not only so, but the gases generated in these vaults are also loaded with the same germs, and rise to the air to be inhaled, or pass by underground air in currents into the neighboring cellars, whence they are sucked, as in a chimney, to poison the air of the whole house. Every cesspool and privy vault is, therefore, so long as it exists, while typhoid fever, scarlet fever, or other infectious fevers are prevailing, a menace to the public health. Instances are innumerable where the fever has been traced directly to them, and where their abolition has been followed by the disappearance of the fever. Leibermeister, one of the most recent and reliable investigators, says,—‘In general we can say that the disposition of any locality to an epidemic of typhoid fever depends largely upon the extent to which the inhabitants breathe or drink the contents of their privies. It is time that an enlightened public sentiment in behalf of public safety should demand that every filth pit, alias fever nest, on the line of a public sewer, should be cleaned out and abolished.’”

The following reports* from the medical profession are more pointed and weighty than pages of comment. It is hoped they will be carefully read and seriously considered.

*Several reports were received from physicians who failed to give their names or towns, hence their reports do not appear in the following pages.

Acworth—C. A. ALLEN, M. D.

None observed.

Andover—H. A. WEYMOUTH, M. D.

Four cases, none fatal. I am not satisfied as to the cause. I saw one case out of town, in consultation, where, I think, bad sanitary condition was the probable cause.

Antrim—I. G. ANTOINE, M. D.

Thirteen cases, two fatal; one in town, not fatal. Twelve in Bennington.* Have given special attention as to the probable cause. The drinking-water was bad, which is the only reason I can give. In five cases the drinking-water probably was not contaminated. In one family, where there were four cases, the drinking-water was good, and all the surroundings excellent, except being near the river (perhaps within twenty or thirty rods), from which, I am informed, a bad odor proceeds at times. In another family, four cases, where the water was bad.

Antrim—MORRIS CHRISTIE, M. D.

Eight cases, one fatal; none observed in town. The cases I had were in Bennington. I do not know the cause. In one family three cases were due to want of care and good nursing.

Barnstead—WILLIAM H. NUTE, M. D.

One case, not fatal. Drinking-water contaminated by sink-drain was the probable cause. The well was situated within twenty feet of the sink-drain.

Barrington—DAVID McDANIEL, M. D.

Seven cases, one fatal; all in town. Cases have been sporadic. One came from Massachusetts.

Bath—HORACE H. HOLLISTER, M. D.

One case, not fatal. I am not able to say what was the cause. This case was a foreigner who came over in June, and was taken sick soon after coming to this town.

*See analysis of Bennington water elsewhere in this report.

Bedford—FRANK H. ROWE, M. D.

One case, fatal. I attribute this case to the water used by the family becoming contaminated by the drainage-water from the sink.

Belmont—S. A. MERRILL, M. D.

Two cases, not fatal; am not satisfied as to the cause. Probably there was not contamination in either case. First case was a bright, ambitious boy of thirteen years, oldest of three children; think he overworked in the early part of the haying season, and might have been exposed to decaying vegetable matter, but no more so than the others who were not ill. The other, a lad of sixteen, in a family of five children, one older and three younger. I know of no reason why he should be ill and the others escape. No especial remark regarding sanitary condition.

Belmont—WILLIAM A. BUCKLIN, M. D.

Four cases, none fatal; one case in adjacent town, not fatal. Have not given special attention to the cause.

Barrington—J. S. DANIELS, M. D.

None observed. I think the reason we do not have typhoid fever more prevalent in country towns is owing to better sanitary conditions.

Berlin Falls—FRANK A. COLBY, M. D.

One case, not fatal; probably caused by moving into a newly plastered house. Have resided in town six months.

Brookline—ALONZO S. WALLACE, M. D.

One case; no probability that the water was contaminated.

Bristol—JOHN C. WHEAT, M. D.

None observed.

Bristol—J. M. BISHOP, M. D.

Five cases, none fatal in town. I was called out of town, about the middle of September, to visit a family where three lay

sick with typhoid fever, and one lay dead in the house. One had been sick three weeks, one two, and the other one. A sister came home to nurse them, and took care of the sickest one night and day. She was attacked in about ten days with very strong symptoms of typhoid fever, but succeeded in cutting it short. These cases were caused, no doubt, by lack of proper sink drainage. After cleansing the surroundings no new cases appeared.

Bristol—H. B. FOWLER, M. D.

Two cases, not fatal; do not know the cause. The water was not contaminated. One case came from Franklin; had no knowledge of the case until it came into my hands; do not know the cause. Have had but little typhoid fever for several years—nothing like an epidemic.

Canaan—E. M. TUCKER, M. D.

Four cases, all recovered. I have given very careful attention, and have endeavored to learn the cause, but have not been satisfied that I have succeeded: failed to find contamination of water, &c. Have failed utterly to find a cause for a disease that I have treated twenty-five hundred feet above the ocean, as well as on the bed of an old lake a thousand feet above the ocean.

Canaan—ARA WHEAT, M. D.

Six cases, one fatal. The first case was a boy of fourteen, who lived near a pond in which the water was low; could find no cause. In a family where two cases occurred, the sink-water was allowed to run into a place outside the house, there to remain for a time, and then to be removed. Two cases caused by a foul cellar.

Canaan—GEO. E. LEET, M. D.

Know of but twelve cases in town. Have attended seven, one fatal. At West Canaan there were nine cases (one more than last year), three fatal. Where the sickness occurred there are flats and no drainage; overflows during high water, and surface water fills most of the wells; soil, light loam; subsoil, muck; water very low and brackish in August, September, and October. I attribute all the cases to impure water. All the wells

are so situated that the water in each might be contaminated from one or more sources, such as barn-yards, sink-drains, and decomposing vegetable matter. My opinion is, that as long as there is low water in warm weather there will be more or less fever. There might be a supply of water brought from some hillside spring which would improve the health of this locality.

Canaan (Vt.)—ARTEMAS WARD, M. D.

Seven cases, none fatal; all in the town of Clarksville (N. H.); all in one family. The first case in the family was a girl twenty years of age, who had resided in Colebrook, N. H., and came home sick. The sanitary conditions of the place were good, but she had frequently called on a person sick with typhoid fever.

Candia—L. E. GRANT, M. D.

One case, fatal; two cases in town. My case came from Haverhill: the locality is reported unhealthy, being near the river, and the land low.

Charlestown—N. G. BROOKS, M. D.

Two cases, imported from Bellows Falls, Vt.; cause unknown.

Chesterfield—DANIEL F. RANDALL, M. D.

None observed.

Chesterfield—JOHN F. BUTLER, M. D.

Two cases, none fatal. Have given special attention to the cause, and attribute it to exposure and filth. Both cases occurred on elevated ground, at farm-houses; both supplied with running spring water; cellars rather damp and not over-clean.

Claremont—A. R. CUMMINGS, M. D.

No zymotic diseases observed this year by me, unless you class pneumonia as such. I had fourteen cases last spring. They all recovered.

Concord—JOSEPH CHASE, JR., M. D.

One case, not fatal. There were two cases in this family, of which I treated only the second. This case occurred some time

after the first case had begun to convalesce. Both patients had been living under the same influences. My patient had taken considerable care of first case, and was already run down in health.

Concord—F. A. STILLINGS, M. D.

Ten cases. Six cases in Concord, one fatal, complicated with pneumonia; two in Bow; two in Canterbury. Attribute the cause to exposure to specific typhoid poison. In the family where the fatal case occurred, two other members of the family had typhoid six months later, although the vaults had been cleansed and disinfected. Two cases occurred in one family in Canterbury, the second five weeks after the first. Of the ten cases, one came from Boston, and undoubtedly contracted the disease by sleeping in a room where the gas from a water-closet was discharged directly into his room. One case came from Lawrence.

Concord—GEO. COOK, M. D.

None in my practice. Have given especial attention as to cause, but have not discovered it.

Concord—G. P. CONN, M. D.

Four cases, none fatal. Have given special attention to cause. I think we are still in the "border land." In two cases the surroundings were bad, there being plenty of filth, yet the water supply was good. Two came here ill—one from Boston and one from Lawrence. I do not know the sanitary condition, but suspect in both cases the sleeping-rooms were adjoining non-ventilated water-closets.

Concord—JULIA WALLACE RUSSELL, M. D.

None observed.

Colebrook—C. C. NORRIS, M. D.

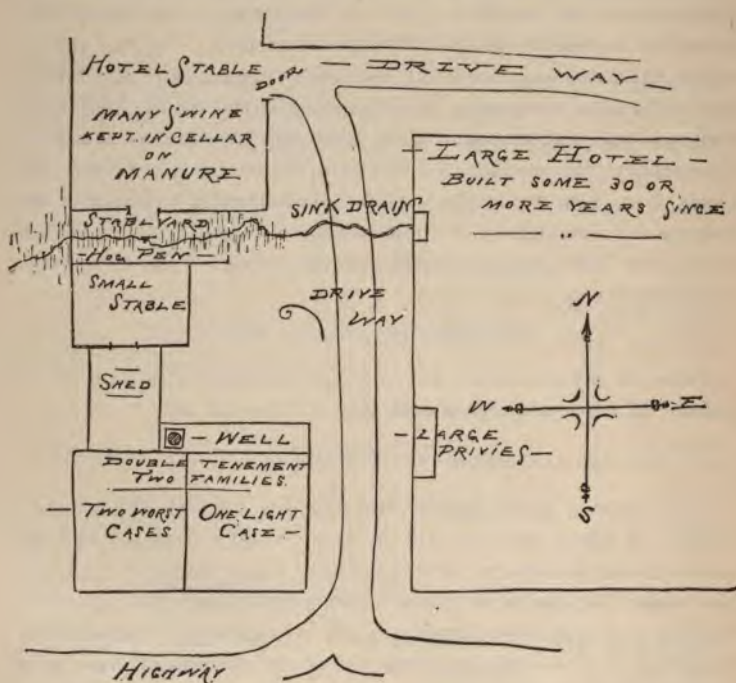
Have had but one case, fatal.

Colebrook—GUY HOLBROOK, M. D.

Only one case, and that was seen in consultation with a physician in an adjoining town.

Conway—SIMEON A. EVANS, M. D.

Eight cases, none fatal. Think some cases were caused by contaminated drinking-water, some by faulty drainage, and in some cases cause unknown. There have been many more cases in town the past year than in previous years.



This little double tenement cottage is occupied by two families of laborers, of correct habits, and cleanly in person and surroundings,—i. e., indoors. In the west tenement the family consists of three persons—man, wife, and daughter. Father and daughter sick: bad and protracted cases of typhoid. East tenement only man and wife: man sick, light case.

The hotel is large, and filled with boarders in summer. A large family, and much transient company the year round. Fifteen to twenty horses are kept in the stable, and as many swine in stable cellar. The well from which these two families

draw their water is say forty feet from the hotel privies, and sixty to seventy-five feet from the large stable. In addition, they are still nearer their own privy and sink-drain. It may be needless to say that, early in the course of my visits, I informed them of the origin of their sickness, and the extreme danger of resorting to that well. They have since drawn their water from purer sources. It would seem that a more striking case of disease from contaminated drinking-water could hardly be found.

Conway—DANIEL WATSON, M. D.

None observed.

Cornish Flat—GEO. W. HUNT, M. D.

None observed.

Deerfield—C. H. TOWLE, M. D.

Five cases, none fatal. Two cases were from Massachusetts, and I had no means of ascertaining the cause. One case occurred at a hotel, and I judge may have originated in the well water, the well being situated near the stable, and on lower ground.

Dover—H. R. PARKER, M. D.

Two cases, none fatal. Both cases were contracted out of the state. Had no knowledge of sanitary conditions in either case.

Dover—SMITH & CHAMBERLIN, M. D'S.

One case, none fatal. Was unable to ascertain the source of the typhoid poison.

Dover—CARL H. HORSCH, M. D.

None in my practice in Dover. Sixteen cases in town, three fatal. Received the number of cases from the physicians. Saw two cases in consultation,—J. T., 48 years, and G. T., 21 years of age, father and son.

Dover—C. A. FAIRBANKS, M. D.

None observed.

Dover—JAS. H. WHEELER, M. D.

Two cases, both fatal; both in town. One case occurred in a tenement which had been closed for some time before the family moved in. Soon after, the case occurred, and was of great severity from the first, the symptoms of poisoning being very prominent. The other case was in what was supposed to be one of our best houses. The cause, in my opinion, was bad plumbing. The house was contaminated with sewer-gas.

Dover—JOHN R. HAM, M. D.

Two cases, not fatal. Both cases in one family. The house was built upon a hillside, and the cellar was excavated in a bank of clay. There was no cellar drain, and the dripping from the faucet in the aqueduct log, and the natural drainage from the stratum of clay, caused a stagnant pool of water twelve feet long and four feet wide in the cellar. The attack occurred in August, 1883.

Dover—EDWARD S. BERRY, M. D.

One case, not fatal. I think it probable that the water used contained the morbid material or germ which caused the disease. This case was a severe but typical one. The patient was a young man who worked in the brick-yard during the summer, and lived in a house close by the yard, together with the other workmen. There were ten or fifteen of the workmen who lived in this house, I think. They used water drawn from a well on the premises. Last year two of the men had a mild form of typhoid fever. This year (1883) there were two cases. One remained under my care, and the other returned home to Nova Scotia, and was sick several weeks. Circumstances over which I have no control render it difficult to eradicate the virus from the locality where these cases occurred, although earnest effort has been made, and will continue to be made.

Dover—T. J. W. PRAY, M. D.

Three cases, one fatal. It is a filth disease, and seems to cling to the same locality after having once existed there. After years, it comes back again. Two cases could be traced to decomposing vegetable matter and cesspool.

Dover—W. B. SULLIVAN, M. D.

Four cases, one fatal. Have given special attention as to the causes, and attribute them to bad drainage and over-filled vaults. Water good in all cases. One case came from Biddeford, Me. Do not know about the sanitary condition.

Dover—M. C. LATHROP, M. D.

One case, not fatal. My only case, G. H. T., male, aged about twenty, single, came home to his parents, who lived in a healthy locality about two miles from the centre of this city, with diagnosis of typhoid, first made by a physician in Amesbury, Mass., where he had been working in a cotton-mill. Convalescence commenced in the third week. His aged parents were the only other inmates of their house, and had almost the sole care of the patient. There was no extension of the disease from this case.

Effingham—J. M. LEAVITT, M. D.

Only one case, recovered. Have given special attention to cause, and attribute it to filth, poor food and water, overwork, and loss of sleep. Not one, or scarcely one, case where the water was not contaminated. I never had more than one case in a family, for I ordered perfect isolation, and disinfected bedding, faeces, etc., very carefully. Have known a whole family to have it, and all die but one. Never had a case myself.

Enfield—VALENTINE MANAHAN, M. D.

One case, recovered. This case occurred in West Canaan, in a family where I had two cases last year. Think, without doubt, it was caused by water polluted by decomposing vegetable matter.

Epping—F. W. SPAULDING, M. D.

Three cases, none fatal; two in town and one in Raymond. Contamination of water the probable cause. Two cases in same locality, where the water used was from the same source—low ground. The patient in Raymond, a youth of fourteen, was

taken sick while attending school in Salem. Think his vitality was rather depressed by too frequent swimming baths during the summer months.

Epping—H. B. BURNHAM, M. D.

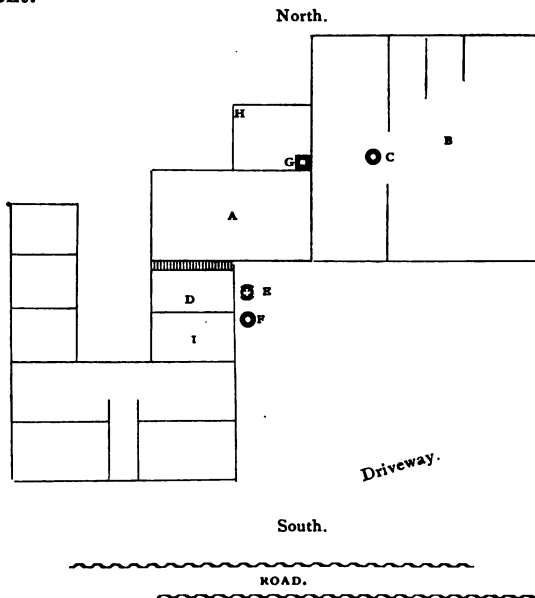
Seven cases, two fatal; one case in town. One case in an adjacent town not having a physician, and five in adjacent towns having resident physicians. In five cases there was bad drinking-water, and in the other two could discover no probable cause. In one case, the water and washings from the sink were deposited on a slight depression of the surface of the ground within about eight feet of the well from which the house was supplied with water for drinking and culinary purposes. In a family with four cases, the well was located near the barn-yard, and within two feet of it, for the purpose of supplying the stock with water during the winter. The yard was large, for the accommodation of a large stock of cattle. Near the well the land was so low that surface-water stood there for weeks during the spring, and in the dry season of the past summer I was informed that the water was very low, and tasted so bad that a supply was obtained from a farm-house near by which had been unoccupied, and the well unused for two or three years. The eldest son, a lad of fifteen, was taken ill with fever, and at my request water was then brought from a neighbor's well some quarter of a mile distant. He died on the forty-eighth day of his illness. A few weeks after, water having made its appearance in the well in the yard, the house was again supplied from it. Soon the youngest child, three years of age, was taken ill with fever; two weeks after, the third, a girl of eleven, sickened with it; a few days subsequent, the fourth victim, a girl of nine, came down with it; and at the present time the father (having sickened since December 31, not to be included in this report), is now ill with the same fever. It appears to me that the cause here is clearly traceable to the water used by this family. In one fatal case the disease was complicated by alcoholic poisoning, the patient having used alcoholic beverages to excess for two years previous to this, his last illness; and although the typhoid symptoms were for the first two or three weeks well marked, he finally succumbed to symptoms unequivocally indicative of his

past habits. The other and last case was a lady past middle life, in affluent circumstances, the sanitary surroundings of whose dwelling were apparently perfect: still, she had the fever in its most violent form, but finally recovered, and is now enjoying excellent health.

Epping—A. C. BUSWELL, M. D.

Three cases, one fatal; fatal case in town. One case in Nottingham, one in Fremont. Have given special attention as to cause, and attribute it to defective drainage and water contamination.

Surroundings of fatal case of typhoid—explanation of drawing: (A) Shed opening into kitchen (D) through a small entry, and also into barn (B) containing a well used somewhat for drinking purposes. (C) Well in barn, about ten feet from privy and hog-yard. (H) Hog-yard; (G) privy; (E) cess-pool from kitchen sink, only a few feet from well (F), used for everything; (I) dining-room, over which was the sleeping-room of patient.



Ground gradually and easily sloping in all directions from house.

I am perfectly satisfied that the well in the barn was affected by both privy and piggery, as well as by the stable itself; also, the well in common use, from the overflow of the cesspool, which was supposed to be emptied every day or so. I found an almost intolerable stench coming from the aforesaid piggery, during a north-east fog that came over during the last illness of my patient. I leave it for any man to draw a conclusion as to the cause of my ill success, taking as many precautions as possible in a sanitary way.

Epsom—DANIEL LINCOLN LOCKE, M. D.

One case of typhoid pneumonia last spring, where there were bad surroundings. Attribute the cause to want of proper drainage and pure air.

Epsom—M. F. SMITH, M. D.

Twelve cases; only one case in a family. Two came from Pittsfield, where there was typhoid fever in the house where they lived.

Exeter—EZRA BARTLETT, M. D.

None observed.

Exeter—WM. G. PERRY, M. D.

None observed.

Farmington—JOHN YOUNG, M. D.

None observed.

Farmington—D. T. PARKER, M. D.

Two cases, not fatal. Have given special attention as to cause, and always attribute it to malaria. Both cases occurred in the same family.

Farmington—H. P. WHEATLY, M. D.

Three cases, one fatal. One case was in Rochester, where the water was liable to contamination from sink-drain; case recovered. All were in localities where the disease has not appeared before for years. The fatal case was in a family which had moved about a third of a mile, into a house that had

not been occupied for over a year. The child was taken sick about three weeks after the change of residence. No reason for the disease could be found except surface drainage and the decay of a heavy growth of weeds.

Fitzwilliam—A. R. GLEASON, M. D.

No cases of purely typhoid fever during the year.

Fitzwilliam—EDWIN G. ANNABLE, M. D.

Five cases. One family having three cases occupied a house situated on flat, low land. A pond near by was drawn off the first of the summer; well failed the last of August; also a neighbor left a dead ox so near that the west wind brought a strong odor from the decomposing carcass. First case, a young man, was taken about September 4, but I was not called until September 11; found patient with temperature 105 and pulse 110. This patient was discharged October 19. After about three weeks from my first call patient had chills and relapse, but made a good recovery from last date. The second case in this family was a girl sixteen years old, who was attacked about October 20 with a very mild form, but with leading characteristics generally observed. The fever ran two weeks, when patient recovered so as to be about the house. A severe cold was contracted, and a relapse followed about November 8; a second relapse December 8 prostrated the patient, but at this writing (February 9, 1884) she is convalescent. The third case was a boy eight years of age, taken December 7; the case ran about three weeks, making a good recovery. In another family, having cellar and drains in a very filthy condition; a girl thirteen years old was taken sick October 1. The family were more or less affected, but none had the fever. This was a typical case, running four weeks, but making an excellent recovery. The fifth case was a young man who had been working in Ashburnham, Mass.; came home with the fever August 30. This case was discharged September 26, running about four weeks. Nearly all the cases had more or less delirium.

Franeestown—THOS. E. FISHER, M. D.

One case, not fatal.

Francestown—H. S. HUTCHINSON, M. D.

None observed.

Gilmanton—S. A. TAYLOR, M. D.

Two cases, none fatal. Have given special attention as to cause, and attribute it to overwork and exposure.

Gilsum—I. A. LOVELAND, M. D.

None occurred in my practice.

Goffstown—A. F. CARR, M. D.

None observed.

Goffstown—FRANK BLAISDELL, M. D.

One case, not fatal. Have given special attention to the cause. This case was caused by bad sink drain.

Goffstown Centre—CHARLES F. GEORGE, M. D.

Two cases, not fatal, both in Dunbarton. Have given special attention as to cause, and attribute the first case to bad water, and the second to contagion. The first case was a young lady of about seventeen years who had been working in a family where the water used during a part of the dry season of August and September was taken from an old unused well near the barn-yard, being situated about twenty or thirty feet distant, and on lower ground. After becoming sick the patient was moved to her home, and in about three weeks a twin sister came down with the disease. No other member of the family was affected.

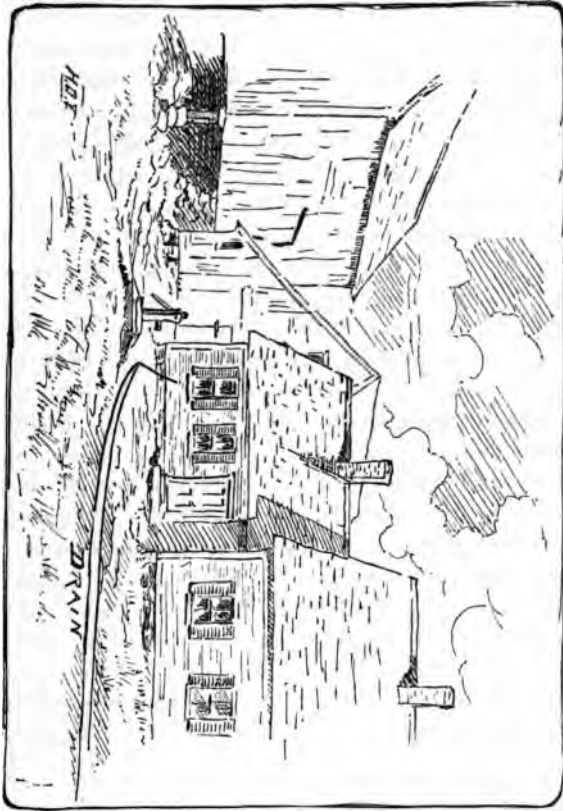
Goshen—F. P. JONES, M. D.

None observed.

Grantham—F. B. PERKINS, M. D.

Six cases, none fatal. In every case there were sanitary defects which might, and probably did, contaminate the drinking-water. In one family there were three cases. A girl nine years of age was the first attacked. She had a long and severe illness, grave abdominal symptoms coming on earlier than usual,

and proving very intractable. Temperature high and rapidly increasing: failure of heart's power required an early and liberal use of stimulants to prevent death from exhaustion. The system seemed overwhelmed from the virulence of the poison. The first thing was to ascertain the source of the morbid agent



which was sending its deadly germs into the household. It was supposed that the sanitary arrangements of the premises were in a good condition. A tour of inspection proved to the contrary, and helped to educate my sense of smell, and also enabled me to assign the cause of the disease. The outlet to an iron sink was found covered with a saucer: upon removing this

there was a fearfully disgusting odor from the lead pipe that discharged into an underground wooden drain; the connection to the drain was in a leaky condition, and the soil was black and in a particularly rich state for several feet beyond the well, which was *located some three feet from the pipe and drain* (see pen sketch). It was evident that the well could not escape contamination. The privy, which was *less than a rod* from the well, could not have increased the purity of the water. These sanitary defects are sufficient ordinarily to account for the disease, but in this case the cellar was found in a damp, mouldy condition, and there was a strong odor of decaying vegetable substances. This, I was informed, was the state of affairs the year round. In the spring of the year the melting snow would run from the steep hill behind the barn into the barn cellar (where there were hogs, manure heaps, &c.), coursing its way to the privy, as the sloping ground favored the flow; passing then under the L of the house it would percolate through the soil into the cellar, causing it to be damp, and a thick mould to form on the walls. Finding this state of affairs, I no longer wondered at the malignant aspect of my patient. Disinfectants were ordered to be freely used about the premises, and what sanitation possible was attended to, but in a week's time two other members of the family were attacked. Both had a mild and short run; one, a boy of thirteen, was a well marked "walking case;" all recovered. Whether the action of the disinfectants on the germs of the disease prevented in the last two cases the severity of symptoms as seen in the first case, is a question which I am aware many observers would answer in the negative. However, I am inclined to think that their use did contribute largely to modify the intensity of febrile action.

Great Falls—LOUIS L. ANGER, M. D.

Nineteen or twenty cases, four or five fatal. Think bad sanitary conditions the probable cause. More than one case in three families caused by contagion.

Greenland—WILLIAM O. JUNKINS, M. D.

Three cases, none fatal, all in Newton and Stratham. Have not given special attention as to cause. The cases were very simple.

Greenfield—S. H. PARTRIDGE, M. D.

One case, not fatal; no other in town. The case was a young man who had been employed in cutting wood and lumber on a tract of low, swampy land. The fever was preceded by a severe cold and undue exposure. The water used was from a well, and uncontaminated.

Greenville—GEORGE F. MUNSEY, M. D.

Three cases, none fatal; two in New Ipswich and one in Temple. Have given attention as to cause, and attribute it to bad drainage. Two of the cases were in one family.

Hampton—WILLIAM T. MERRILL, M. D.

Ten cases, one fatal; four cases in town, one fatal; one in Rye, five in North Hampton. Upon investigation, attribute the cause to bad water and improper drainage. Of those occurring in Hampton, the fatal case came from Somerville, Mass., one from Rye, N. H., one from Vermont, and one from Plum Island. Two cases in one family in North Hampton were caused, in my opinion, by impure water. The case in Rye was probably caused by contamination from cesspool.

Hanover—C. P. FROST, M. D.

None observed.

Hanover—WILLIAM T. SMITH, M. D.

Three cases, none fatal; two cases in town. In one case the patient, a student, had been working for a fortnight in constructing a railroad, and was exposed a good deal to the November weather. Cause of fever unknown. In the other cases the patients were in poor condition of health, but no cause (immediate) was manifest. Water probably not contaminated.

Haverhill—M. D. CARBEE, M. D.

One case, not fatal; none in town. This case was in a family where everything was kept in good order, across the river in Newbury, Vt., and was very mild.

Henniker—HENRY A. WATSON, M. D.

None observed.

Henniker—LEONARD W. PEABODY, M. D.

None observed. It has been a remarkably healthy year. No cases of typhoid, and but few of dysentery and bowel complaint.

Hill—W. F. BALDWIN, M. D.

Five cases, four in town, one fatal; one in Franklin, near the town of Hill, which I attended. Have given special attention as to cause, and in my opinion four cases which occurred in one family were caused by filth. The general conditions favored the disease. The sink drainage lay open on the ground for years. Vault was within six feet of the room where the milk and food were kept. Large amount of decaying vegetable matter in the cellar, and barn drained directly toward the house, which is situated on a flat piece of ground about thirty feet distant. In my opinion the cause was principally due to the milk and food, favored by the general conditions. Could gain no facts in regard to the cause in the other case.

Hillsborough Bridge—A. C. BURNHAM, M. D.

Eight cases, none fatal; six in town, two in Deering. Have given no very special attention as to cause. I attribute the cause in some cases to hot and dry weather, with low water. Three cases in one family, with one relapse: cause, bad water and unhealthy surroundings. One case was from Hooksett; had a regular run of typhoid fever; know nothing of the sanitary conditions of the place.

Hillsborough Bridge—MARCELLUS H. FELT, M. D.

Six cases, one fatal. In three cases polluted water was the cause without doubt; cause not known in the others.*

Hinsdale—M. C. DIX, M. D.

Five cases, none fatal. Attribute the cause to *contagium vivum*.

* See report, with diagram, on water pollution.—I. A. W.

Hopkinton—GEO. C. BLAISDELL, M. D.

Three cases, one fatal. Endeavored to make a thorough investigation, but was unable to define a cause. The fatal case was that of a man, a resident of Salisbury, who was returning from a visit to towns below with cattle, when taken sick. The cases that occurred in my practice were surrounded by unusually good hygienic conditions, and I think the water supply was better than the average. I was unable to account for the cause of these cases.

Hopkinton—G. H. POWERS, M. D.

Two cases, not fatal. Attribute the cause to bad drinking-water when the well was low. Both these cases were the mothers of families, and were confined to the use of this water. They were the only members of the families who were real sick.

Hudson Centre—D. O. SMITH, M. D.

Five cases in one family, none fatal; all in West Windham. Have given special attention as to cause. In these cases the water used was contaminated from an imperfectly constructed vault and sink-drain. I regard typhoid fever as a zymotic disease, and contagious. During the past year this vicinity has been unusually free from all forms of malarious disease.

East Jaffrey—O. H. BRADLEY, M. D.

Not a genuine case during the past year.

Keene—GEO. W. FLAGG, M. D.

None observed.

Keene—W. R. DUNHAM, M. D.

Have not had a case.

Keene—GEO. B. TWITCHELL, M. D.

Three cases, none fatal. Could not trace the cause.

Keene—S. M. DINSMORE, M. D.

Three cases, one fatal. Have given special attention as to cause, and attribute it to bad sanitary surroundings, especially

sink-drains, etc. The one fatal case was sick for about eleven weeks, and was gradually worn out with abscesses. In fact, for the last five weeks it seemed more like a case of pyemia. The cause in this case may fairly be attributed to bad condition of vault and sink-drain.

Keene—GARDNER C. HILL, M. D.

Thirteen cases, none fatal. Have given special attention as to cause, but have been unable to detect it. The water probably was not contaminated. Eleven of the cases were in Keene, the others in Roxbury and Sullivan.

Kingston—THOS. O. REYNOLDS, M. D.

One case, recovered. This case, a boy aged thirteen, came from Salem, Mass., where he passed the first week of the disease. Was a good strong case. No other members of the family had the disease, precaution being taken to keep the younger members away from the patient. All excretions were immediately and carefully deposited in a large ammoniacal dung-hill composed of horse manure in process of "heating." I regard this as an easy, usually available, and perfectly safe mode of caring for dangerous excretions. Vessels were also allowed to contain Sol. Ferri. Sulp. previous to evacuations.

Laconia—T. S. FOSTER, M. D.

Very few, mild cases, none fatal. In many cases I think it is due to exposure, repeated colds, etc.; in others it is doubtless of a malarial origin. Do not know that the water was contaminated in any case. Typhoid fever and scarlatina have been rare in this community for the past three or four years, and then nearly always of a mild form.

Laconia—R. W. WILEY, M. D.

None observed.

Langdon—C. M. LUFKIN, M. D.

One case, recovered. Not traceable to any probable cause.

Lake Village.—O. W. GOSS, M. D.

None observed.

Lancaster—FRANK SPOONER, M. D.

Seven cases, none fatal; five in town, two in Lunenburg, Vt. Think these cases were caused by bad drainage. They all occurred in one house, and there was an open drain or cesspool near the back door. The spring water was good.

Lebanon—J. A. DAVIS, M. D.

One case, not fatal. Attribute the cause to bad drainage. In this case the water was affected by cesspool.

Lebanon—T. H. CURRIER, M. D.

None observed, have not heard of any.

Lempster—J. N. BUTLER, M. D.

None strictly typhoid. Typhoid is not as prevalent as formerly, and still, if our theory in regard to its origin is correct, the wonder is that it is not more so, considering the lack of care in regard to sink-drains, privies, etc., the condition of some being such as would quite astonish the heathen.

Lisbon—C. M. BOYNTON, M. D.

Eighteen cases, none fatal: sixteen in town, one in Landaff, and one in Lyman. Gave special attention, but could discover no special cause. All used apparently pure spring water. Two cases occurred in one family where the wife had it after caring for the husband. Most of the cases were of severe form, lasting about four weeks. In some or them convalescence was slow, but recovery perfect in all.

Lisbon—GEO. A. MARTIN, M. D.

Eight cases, none fatal. Have given special attention as to cause, and to the best of my belief bad water, poor sink-drains, and other sewage were the probable cause. Three cases were in one family, and the cause was evidently an old sink-drain that had been stopped up, and broke out near the back door. There was a case of typhoid fever in the same family last year, and I think some of the fecal matter got in the drain.

Littleton—T. E. SANGER, M. D.

Six cases, one fatal; two of them, including the fatal case, in Bethlehem. Have given special attention as to cause. In one case there was no doubt but it was due to bad water. One, I think was caused by exposure to the steam from the washing of the case I lost in Bethlehem. In one house (a summer boarding-house) a servant was taken sick; water, drainage-water, closets, &c., all right: no cause could be ascertained. It was a typical case, died fifty-seventh day, from relapse and chronic lung complication. After her death (ten days) a little son of the proprietor was taken, had a run of two weeks, and recovered. It was this case that was caused by the steam from the washing.

Littleton—HENRY L. WATSON, M. D.

Nine cases, mostly mild; one fatal case in Bethlehem. Have not given special attention as to cause. None of the cases could be charged to water contamination. I was called to the case in Bethlehem (a lady seventy-three years of age) Nov. 1; had been sick (a cold, as she said) one week. Pulse 96, temperature 102, tongue slightly coated, throat a little sore; rate of respiration could not be determined, on account of terrible neuralgia in left side of head, causing her to catch and hold her breath. Death occurred Nov. 9.

Littleton—GEORGE W. MCGREGOR, M. D.

Six cases; four in town, two fatal; two in Bethlehem, none fatal. There is no doubt but in five cases, and possibly six, the water used in the families was contaminated by cesspools, sink-drains, decomposing vegetable matter, &c. One case (recovered) came from Bethlehem; lived in an old tumble-down house with filthy surroundings. In one fatal case,—Mrs. B., aged twenty-seven,—a hen-house containing thirty-two hens was attached to the end of the house. Patient occupied room on second floor, in the end next the hen-house; window opened upon hen-house, from which the stench was most foul. It also pervaded the kitchen under sleeping-room. Drinking-water was procured from well not twenty feet from privy. Patient died on the fifteenth day. Patient had had great œdema of lower extremities, and albuminous urine during pregnancy, two or three

years prior. Mrs. B., aged 23, was taken sick Aug. 14; died Aug. 24. Suffered but little pain throughout course of disease. She was poorly nursed, and would fret and order in her natural, erratic way, going from one bed to another in same room whenever it pleased her to do so. The house stood but a few rods from an old mill-pond, drained low at this time, and full of decaying logs, bark, sawdust, &c. House was old and low-posted. Outer door opened into an entry not more than six feet square, out of which, at the right, opened a door into a large room, containing two patients, and beds in two corners, between which patient would vibrate. The night before she died she insisted upon having the outer door, also inner door and a window on two contiguous sides of room, open. During the evening there arose a terrific rain-storm, with high wind, all through which the doors and windows remained open. At two o'clock in the morning she complained of pain in abdomen, had one or two movements of bowels, also had a chill, I believe. She died in a collapse nine hours after first experience of pain in abdomen. The daughter, about four years of age, was stricken with the disease Aug. 27. She was removed to another house a mile distant, and had an ordinary run, of short duration. I dare say her fever was produced by same cause as the mother's, *i. e.*, close proximity to mill-pond.

Littleton—B. F. PAGE, M. D.

Sixteen cases; twelve in town, none fatal; four in Dalton, one fatal. Have given special attention as to cause, and attribute it to bad water and close packing in tenement-houses. In one family having five cases the disease was undoubtedly caused by bad water and stench from water-closets and hog-pens. Privies were within thirty feet of front door used by at least forty persons, and hogs were just back of privy. This family used water from a spring that came out of a bank about sixty feet below, on side hill, and was undoubtedly contaminated by leachings from privy and hog-pens.

Littleton—F. T. MOFFETT, M. D.

Six true cases, I think; all recovered. One case came from Lisbon, and one from Waterford, Vt. Two cases in Dalton. Think the disease was due to bad drains and vaults.

Londonderry—EUGENE WASON, M. D.

There have been no cases in this section, to my knowledge. I think it largely due to the plain talk I have given people in regard to sanitary matters, for when I came here years ago it was a hot-bed of typhoid.

Lyme—WALTER R. BARNES, M. D.

Four cases, one fatal. In one family there were two cases. I gave some attention to the cause, and in one case think it due to bad surroundings. In all cases the water-supply was from springs some distance from house.

Madison—E. T. HUBBARD, M. D.

None observed.

Manchester—C. M. DODGE, M. D.

Seven cases, none fatal. Have not given special attention as to cause. The water was good in all cases, unless our city water is bad. There were two cases in one family, and this, I think, was owing to continued exposure and care of mother by her daughter. One case that I saw went home to the upper part of the state, and, I afterward learned, died in about ten days.

Manchester—CHARLES COREY, M. D.

Five cases, all in one family. No particular cause, that I am aware of.

Manchester—JACOB W. MOOAR, M. D.

One case, recovered. Investigated as to cause, found none.

Manchester—W. W. WILKINS, M. D.

Two cases, none fatal. One case imported from Washington, D. C. Do not know what sanitary causes may have given rise to this case. It continued from May 12 to June 17. In 1882-'83 a number of cases of typhoid fever originated at No. 26 Market street, a large corporation boarding-house. Two cases in 1882 and one in 1883 came under my care. All were

removed to hospital, and recovered. The only cause that I could discover on the premises were bad sanitary conditions. The sewer connections were defective. These were overhauled and repaired in May, 1883. Have no knowledge of any typhoid since.

Manchester—GEO. D. TOWNE, M. D.

None observed.

Manchester—CHAS. F. FLANDERS, M. D.

Five cases, one fatal.

Manchester—G. B. MOREY, M. D.

Two cases, one relapse: both good recoveries. The sanitary conditions, so far as I am able to judge, were good. In one case there might have been contamination of water from barn-yard.

Manchester—H. DEW. CARVELLE, M. D.

None observed.

Manchester—H. C. CANNEY, M. D.

Two cases, none fatal. In one case the cause was not traceable; in the other, the water used was from a spring contaminated by drainage from cesspools and water-closets. Cases long continued, but mild.

Marlborough—N. H. MERRIAM, M. D.

Four cases in town of Roxbury, all in one family; none fatal. The sanitary conditions were the worst possible. House situated on a flat; drinking-water contaminated from close proximity to foul hog-pen, slops, and vault. All cases had characteristic temperature, rose spots, and diarrhoea. Nothing malarial noticed.

Marlow—MARSHALL PERKINS, M. D.

One case, recovered, in Sullivan. Not able to satisfy myself as to cause. A case occurred in the family previously, under the care of another physician. The town of Sullivan is essen-

tially a farming town. Its inhabitants are quite evenly distributed over its whole surface, and are more than usually isolated. Heretofore the town has been comparatively exempt from typhoid fever. The past season there have been a large number of cases for so small a town. There is no apparent reason why the water should not have been as pure as usual, or the surroundings as cleanly.

Meadows—

Two cases, neither fatal. Have not given special attention as to cause. One case came from Lunenburg, Vt.

Meriden—H. COOPER, M. D.

One case, recovered. Have given special attention as to cause. The water was contaminated from sink and vault.

Merrimack—WARREN W. PILLSBURY, M. D.

Three cases, one fatal; two in town; one in Bedford, not fatal. Have given special attention as to cause. In one case, a young man aged nineteen, it was caused by lying around on the ground in the evening. The fatal case was a man much reduced by chronic bronchitis; no known cause for the disease other than given.

Milford—A. W. SMITH, M. D.

None observed.

Milford—W. H. DINSMORE, M. D.

Three cases, one fatal. Have given special attention as to cause. Two cases caused by impure water, one by bad drainage.

Milton—W. F. WALLACE, M. D.

Five cases, one fatal. Two cases in adjacent towns. Caused by infected water.

Mont Vernon—FREDERICK CHANDLER, M. D.

None observed.

Nashua—GEO. F. WILBER, M. D.

Three cases, none fatal. Upon investigation, attribute one case to water taken from a well about two hundred feet from a cemetery, one to imperfect sink-drain, and in one case assign no cause. In the family having the contaminated well, a few days before the child was taken sick, another went into Vermont and was treated, I am creditably informed, for a smart attack of typhoid fever.

Nashua—HENRY G. DEARBORN, M. D.

None observed.

Nashua—J. N. WOODWARD, M. D.

None observed.

Newmarket—CHAS. A. MORSE, M. D.

Two cases, none fatal. Do not think the water was contaminated in any of the cases. Did not give special attention as to cause. This town has been very free from fevers, etc., during the year.

New Boston—C. A. WEAVER, M. D.

One case, not fatal. I found enough animal and vegetable decomposition to give development to the disease, to which I attribute the cause.

New Boston—H. D. GOULD, M. D.

None in town to my knowledge.

New Ipswich—FREDERICK W. JONES, M. D.

Two cases, neither fatal. The drinking-water in all probability to a great degree was the carrier of disease and organic emanations from pools, marshes, and ponds, during low water. In one case the water was supposed to be pure and free from all drainage. One case came from Ashley, Mass. The dwelling-house was located upon high land.

New Ipswich—FREDERICK JONES, M. D.

One case. Have frequently thought the cause could be traced to the drying up of marshes and ponds and to sluggish streams.

New Ipswich—F. N. GIBSON, M. D.

No cases of true typhoid fever observed.

New London—JOHN P. ELKINS, M. D.

Two cases, one fatal. These occurred in Wilmot. Investigated as to cause. One was due to imperfect drainage; was not able to arrive at any definite conclusion in the other.

Newport—DAVID M. CURRIER, M. D.

One case, not fatal. The drinking-water was contaminated by sewage, and the house was filled with sewer-gas. The tenement where this case occurred was built upon an incline, so that the back part of it was under ground as much as an ordinary cellar. The sink, which was in the back or underground part, emptied its contents through the floor upon the ground beneath, and no further care was taken of it. I was told that the smell arising from it at times was almost unbearable.

Newport—WM. W. DARLING, M. D.

Two cases, recovered. I have given special attention as to cause. Attribute one case to drain from sink. Could not say that the water was contaminated, but do not think we take the care we should in regard to cesspools and sinks. One case came from Franklin.

Newport—T. B. & C. A. SANBORN, M. D'S.

Six cases, one fatal. Attribute the cause, in two cases, to bad water and drainage; in four cases cannot state the cause. Three cases in one family, using spring water. Drainage not good, sink-spout emptying on to the ground, but it was during cold weather.

Newton—F. H. MORSE, M. D.

Four cases, none fatal. Have investigated the cause wherever I could. Two cases were taken sick in Haverhill, and one in vicinity of bad cesspool.

Northwood—J. W. PRAY, M. D.

One case, not fatal. Have given special attention as to cause, and attribute it to improper drainage.

Northwood—C. W. HANSON, M. D.

One case, not fatal, in Barrington. Attribute the cause to filthy cellar; vegetables were allowed to remain in the cellar the year round and decay. The family has suffered from the disease for the two preceding years.

Ossipee—M. A. HARMON, M. D.

Three cases, none fatal. Two cases occurred at the county farm, and perhaps were caused by filth, although the house is well kept for a place of this kind.

Ossipee—WM. H. GRANT, M. D.

None observed. This town is remarkably exempt from this disease.

Pelham—A. BATCHELDER, M. D.

None observed. Three cases occurred in one family. The patients were attended by a non-resident physician from Methuen, Mass. The family moved to a place where the well had not been used for a long time, the probable cause of the disease which made its appearance soon after removal.

Penacook—WM. H. HOSMER, M. D.

I have not seen a genuine case of typhoid fever in our vicinity the past year, and do not believe that we have had a genuine case during the past twelve months. We have occasional fevers that assume a typhoid type. I do not hesitate to say that we are not a filthy, sickly people in our vicinity. We have pure air, plenty of exercise, and a good supply of healthy food.

Peterborough—CHAS. F. OBER, M. D.

One case, recovered. Have given special attention as to cause, and attribute it to defective drainage.

Peterborough—J. H. CUTLER, M. D.

None observed.

Peterborough—J. N. MAYO, M. D.

None observed.

Peterborough—WM. D. CHASE, M. D.

None observed. We have been quite exempt from typhoid fever for the past few years. Why it is so we cannot explain, as the water supply and the sanitary conditions are the same as they were a few years ago, when we saw a good deal of it.

Pittsfield—EDGAR L. CARR, M. D.

Seven cases, none fatal. Could not account for the disease. Water was not contaminated.

Plaistow—EDMUND B. FRYE, M. D.

Three cases, none fatal. Attribute the cause, in two cases, to decomposing animal and vegetable matter. One case came from Haverhill, Mass. Occupied a room near a filthy water-closet. No other assignable cause.

Plainfield—CHAS. C. BECKLEY, M. D.

Three cases, none fatal. Have not given special attention as to cause. Do not know whether the water was contaminated. One case came from Boston, Mass., in the early stage of the disease.

Plainfield (Meriden)—HUBERT SLEEPER, M. D.

No fatal case. One case came from Claremont, and was taken sick soon after arriving here.

Plymouth—ROBERT BURNS, M. D.

Two cases, one fatal. Have given special attention as to cause. No 1 uncertain. No. 2 was caused by bad sanitary conditions, drinking-water possibly contaminated. No. 1, T. S., came here from the Flume House, and was almost immediately taken sick: he was very sick all through October and a portion of November. We have but little drainage in this town, and what there is is of the poorest kind.

Plymouth—CYRUS K. KELLEY, M. D.

Three cases, none fatal. Could assign no special cause. Our town of Plymouth has been remarkably free from typhoid fever the past year.

Plymouth—TRISTRAM ROGERS, M. D.

Two cases, not fatal. The disease has not been sufficiently prevalent to assign any reasonable cause. In both cases aqueduct water was used, and is regarded pure.

Portsmouth—J. W. PARSONS, M. D.

Seven cases, one fatal. In four cases there could have been no trouble with the water. One case due to open drain in cellar, one case caused by bad water, and in one supposed to have originated in Great Falls. Could get no satisfactory information concerning circumstances. Two of the cases were men who belonged to a fishing schooner. This schooner had a crew of twelve men. Seven of the number were sick, four with undoubted typhoid fever, as reported by three different physicians. Each physician attributed the cause to polluted water taken into the schooner's casks. The water was taken from different sources at different times, but that which caused the sickness was probably taken from a well at Boothbay, Me. No facts concerning the conditions or surroundings of the well could be obtained. Sickness began to develop soon after the use of this well-water. I am well acquainted with the captain of this schooner, and it is not probable that the sickness resulted from any uncleanness in the schooner. It is probable that the others of the seven sick men had mild forms of typhoid fever; at least their symptoms, as given by their mates, so indicated.

Portsmouth—D. W. JONES, M. D.

None observed.

Portsmouth—N. L. FOLSOM, M. D.

None observed. Our town is not a typhoid town.

Raymond—TRUE M. GOULD, M. D.

Ten cases, none fatal. Seven in town, one in Candia, two in Fremont. Cases probably caused by impure drinking-water.

Rindge—W. H. ALDRICH, M. D.

Two cases, none fatal. Have given special attention as to cause. One due to water contaminated by sink-drain and privy, the other by decaying vegetable matter.

Rochester—JAMES FARRINGTON, M. D.

Six cases, none fatal. Upon investigation could discover no real cause for the disease. In one case the disease was contracted in Dover.

Rochester—F. E. WHITNEY, M. D.

Two cases, none fatal. Attribute the cause to poverty, bad ventilation, filth, etc.

East Rochester—STEPHEN YOUNG, M. D.

Two true cases and one modified case of typhoid fever, none fatal. One case occurred in a locality near the river. The water in river became very low, and at that time the effluvia was very offensive. In the other cases I have no opinion as to the manner in which the poison was introduced into the system.

Rollinsford—FRANK E. BRIGHAM, M. D.

None observed.

Rumney—A. C. HALL, M. D.

One case, not fatal.

Salmon Falls—W. B. MACK, M. D.

None observed.

Salisbury—JOHN J. DEARBORN, M. D.

Have had two cases of typhoid fever, with the following history: The house was erected about 1790. All out-buildings connected with the house, and all situated on low ground. The well was dug some twelve feet deep, and was twenty-five or thirty feet west of the kitchen, which was on the west side of the house. For many years all waste water was emptied into the sink, and conveyed a few feet from the house through the

sink-spout, and there allowed to soak into the ground in close proximity to the well. In the summer the sun shone on this filth, and the gases were conveyed into the house through open windows. The privy was thirty feet south of well, and cleansed but once a year. South of this was an exposed pig-pen, and about sixty feet south-east from the well a large cow-yard. The grandparents had the fever very severely. Their only son married, and remained on the homestead, his wife having previously had the fever. Some years ago this son had typhoid fever, which run twenty-seven days. He recovered, and died of consumption a year ago, undoubtedly caused by this same water and exposure. This son and wife had six children. One son had a short run of the fever after I came here. The latter part of last June (1883) the two youngest girls, aged eight and ten years, had the fever, and after a run of twelve days made a rapid recovery. A new well was dug some ten rods east of the house, and no sickness has since occurred.

Sanbornton—EDWARD ABBOTT, M. D.

Four cases, one fatal; two of the cases in town. One, a student at Tilton, contracted the disease in an old house where there has been typhoid fever for years. Contaminated drinking-water in one family, with two cases.

Seabrook—D. W. COLCORD, M. D.

Two cases; one in town, fatal; one in Hampton. Have given special attention as to the probable cause, and attribute it to absorption into the system of decomposed animal or vegetable matter. In the fatal case nervous symptoms predominated. The patient, a young man, worked at a shop window directly over a pig-sty. Got intoxicated, and took a severe cold. His domestic affairs were disturbed by the unfaithfulness of his wife, which produced great mental depression. Died in four weeks with ataxic symptoms.

Somersworth—ALVIN JENKINS, M. D.

Some half dozen or more cases, none fatal. Have given special attention in all cases as to cause, and attribute it to something like the following: Some of the patients had for

many consecutive months overtasked their mental and physical powers in too close and foul an atmosphere, while others had been reduced by prostrating chronic maladies, which rendered their systems the more open to the disease in question.

Springfield—D. P. GOODHUE, M. D.

One case, fatal. The case was a young man who worked in Cheney's mill at Manchester. He said there was one other case where he boarded.

Strafford—N. C. TWOMBLY, M. D.

None observed.

Strafford—H. C. COBURN, M. D.

None in my practice. We have had no true marked cases of typhoid fever. Some parts of town quite hilly; drainage good.

Surry—W. H. PORTER, M. D.

None observed.

Sunapee—E. C. FISHER, M. D.

Three cases, one fatal from complication of gastritis. Have not been able to discover any cause. Do not think there was any contamination of water. Commenced practice in Sunapee about the first of August. One case occurred before I came. One of my cases occurred in Springfield.

Suncook—G. H. LARABEE, M. D.

Have not had a well marked case this season.

Suncook—J. R. KIMBALL, M. D.

Only one well defined case. At present time the patient is suffering from relapse. This case is in a tenement-house on one of our corporations, where the surroundings are not of the cleanest type. Three other children in the family, but no other cases yet. Think the water is good: quite a large number of families use it. Cesspools and vaults are not good.

Sutton—S. N. WELCH, M. D.

None observed. This town has been very free from typhoid fever for the past seven years, having averaged not over one case a year during that period.

North Sutton—JAMES R. SMILEY, M. D.

Have not seen a true case of typhoid fever during the past year. Colds and coughs have at times been prevalent, with occasionally a case of pneumonia, some of which have assumed a typhoid type; none fatal.

Swanzey—GEO. I. CUTLER, M. D.

One typical case, not fatal. This case probably caused by impure water. This case was from Keene. While several years ago typhoid fever was quite prevalent in West Swanzey, last year there was but a single case, and that not very marked. The improvement seems to be owing to the demolition of some old tenement-houses, and the filling up of ponds of stagnant water.

Tilton—CHARLES R. GOULD, M. D.

Thirteen cases, none fatal. Attribute the cause to filth, improper and insufficient nourishment, and overwork. Five cases in one family.

Troy—M. T. STONE, M. D.

None observed.

Union—JOHN E. SCRUTON, M. D.

None observed.

Walpole—ABEL P. RICHARDSON, M. D.

None observed. Have practised in Walpole for nearly twenty years, and the past year has been the only one in which I have not observed and attended cases of typhoid fever. Not a case in town to my knowledge under care of any physician.

Walpole—GEO. A. BLAKE, M. D.

None observed.

Walpole—W. B. PORTER, M. D.

Have had no well marked cases the past year, which is very uncommon for this section. No epidemics in town, or in surrounding towns, the past year. Think the prime cause of typhoid fever arises from improper sanitary conditions.

Warren—ROBERT E. MERRILL, M. D.

None observed. Have not known of a case in this vicinity during the past year.

East Washington—GEORGE N. GAGE, M. D.

None in my practice. One case in town, not fatal. There have been no cases of typhoid fever within three miles of this village during the past year.

North Weare—R. O. WOOD, M. D.

One case, not fatal. Attribute the cause to malaria from mill-pond in vicinity. During the whole course of the fever the temperature was very even and uniform, 102 in the morning and 103 in the evening, excepting one afternoon, when it rose to 104.

Wentworth—F. A. DURKEE, M. D.

No fatal case.

Westmoreland—G. W. CHAMBERLAIN, M. D.

None observed.

Whitefield—J. L. MCGREGOR, M. D.

None observed.

Whitefield—GEORGE S. GOVE, M. D.

None observed. Had one case of typhus which proved fatal; the patient came from New Brunswick to Carroll, N. H., and had been sick a week or ten days before I saw him.

Whitefield—GEORGE H. MORRISON, M. D.

None during the past year. In previous years have attributed the cause to impure water. In one case water stood in the

cellar all through the fall ; two cases in same house, and others showed typhoid conditions.

Wilton—J. FLEEMAN, M. D.

Six cases, none fatal ; four or five of them in adjacent towns. Two severe cases in one family ; think the second due to contagion. I always look into every matter with as good common sense as I possess, and do not say this is the cause or that is the cause, as some of our younger members of the profession do. It is quite doubtful if any of us know quite as much as we think we do in relation to what causes disease.

Wilton—GEORGE W. HATCH, M. D.

Six cases, none fatal. Two of the cases were quite marked, the other four were not. I scarcely knew what to call them. They resembled typhoid in a great many respects, but were very mild. Could discover no cause for them.

Winchester—GEORGE W. PIERCE, M. D.

None observed.

Winchester—WEBSTER O. HARDY, M. D.

None observed.

Wolfeborough—N. H. SCOTT, M. D.

Three cases, one fatal ; can give no cause. Two cases in one family. The first came from another locality. For a number of years we have had but a few cases each year, and these have been isolated and of a mild character.

Woodsville—C. R. GIBSON, M. D.

Six cases, none fatal ; attribute the cause to filth and bad drainage. Two cases in one family.

DIPHTHERIA.

This disease, by a very great unanimity of professional opinion, is pronounced one of the worst types of filth disease known to civilization. It pervades the community frequently as an epidemic, in which the unsanitary conditions of the locality are observed to be the *vis a tergo* that keeps alive its virulence, although at such a time households which have maintained, so far as appearances go, a good sanitary condition of affairs are attacked. Individual or sporadic cases, which spring up occasionally here and there, are almost always found to be associated with defective sanitation, if this point is rigidly examined. Good sanitary conditions are also known to greatly modify the severity of this disease, where it is introduced by contagion or other cause. It is probable that there is some essential factor whenever this or any other disease appears as an epidemic, that is not well, if at all, understood; yet too much should not be ascribed to this fact, as has been done in the past. Mankind is fast learning to search for natural causes, to examine the results of fixed laws, and not to credit, as of old, the traditions of ignorance and the predictions of the bigoted astrologer, or the cant of zealous pseudo religious fanatics. Science, observation, reason, knowledge, and good sense have made a long stride beyond the limited horizon of the past. Diseases which a few years ago were objects of speculation, are now as well understood etiologically and pathologically as the simplest problem in mathematics. It is observation, it is the sad lesson of the fearful experience, that has shown the profession the close relation of diphtheria to filth, or, in other words, to uncleanness. This charge is made against the environments of the family, and not the individual. The sanitary defect may be so slight as to escape the closest scrutiny, like the leakage of gas from the break in the sewer, or the pollution of drinking-water from an under-ground cesspool, or any other unsuspected cause. Nevertheless it is conclusively proven that filth in some of its varieties is essential to the maintenance of this disease.

The dangers resulting from the exposure of children to the contagion of the disease by allowing them to visit in the room of another who has the disease, is very much greater than com-

monly supposed. The lives of many precious children have been sacrificed in this senseless and criminal way.

Public funerals of persons dying of this disease are no longer allowed in this and many other states. Local boards of health should see that this is enforced in every town.

The weight of evidence to be found in the following reports is overwhelmingly in the right direction. It should be a strong warning to the public.

Acworth—C. A. ALLEN, M. D.

One case, fatal. Isolation would greatly reduce its fatality throughout the state. This was the only true case of diphtheria occurring in town the past year, and I had it isolated with as much care as though it had been small-pox, and had the child buried the same day of death without a public funeral. Two other children in the family escaped.

Andover—H. A. WEYMOUTH, M. D.

Seven cases; one in town, not fatal; six in Wilmot, all in one family, one fatal. The mother was first taken; all the children were taken nearly the same time. The youngest child, an infant, escaped. The father had a very slight sore throat. Think it was caused by polluted water.

Antrim—MORRIS CHRISTIE, M. D.

Four cases, none fatal, all in Stoddard.

Antrim—I. G. ANTHOINE, M. D.

Seven cases, one fatal; four in Hancock, one fatal; three in Bennington. Three of the cases in Hancock occurred in one family. One member of this family came from a family in Peterborough where several cases had occurred (one fatal), making it appear in these cases to have been contagious,—more so than I have ever noticed in my practice before. Think there is something about it that isolation will not remedy. One of the cases, a young man from the family in Hancock having the three cases, after recovering returned to the place (about three

miles distant) where he had been employed, and where was a boy about three years of age. He fondled and played with the child, and in a few days the child had diphtheria and died.

Ashland—M. C. SPAULDING, M. D.

None in my practice.

Bath—HORACE H. HOLLISTER, M. D.

Have not had a case.

Barrington—DAVID MCDANIEL, M. D.

Six cases, none fatal. Think isolation would greatly reduce the number of fatal cases throughout the state.

Barnstead—WM. H. NUTE, M. D.

Five cases, three fatal. Considered bad sanitary conditions a factor in every case. Gave special attention as to cause, and found polluted water and decaying vegetable matter. Think isolation would greatly reduce its fatality throughout the state. Have never allowed public funerals; buried as soon as possible after death. Four cases occurred in a French family, children aged two, four, eight, and twelve. Water always in cellar; house had been closed for nearly a year; last family left considerable vegetable matter in cellar; all taken sick within forty-eight hours. In the other case found some decaying vegetable matter in cellar, otherwise the best of sanitary conditions.

Bedford—FRANK H. ROWE, M. D.

None observed.

Belmont—WM. A. BUCKLIN, M. D.

None observed.

Belmont—S. A. MERRILL, M. D.

Two well-marked cases, recovered. Have given special attention as to cause; cases were idiopathic. My opinion would be that isolation would most decidedly reduce the number of fatal cases throughout the state, but my experience will hardly coincide. My first case was a married woman about twenty-one years of age, the other a widow of about thirty years. Could not

satisfactorily trace the cause in either case. In each the local symptoms were severe; the constitutional effects moderate in one and severe in the other. Have had many cases of tonsilitis and angina, but only two of well-marked diphtheria.

Barrington—J. S. DANIELS, M. D.

No genuine cases. Isolation is important. Think public funerals are a means of communicating the disease, and should be prohibited.

Berlin Falls—F. A. COLBY, M. D.

None observed.

Bradford—B. D. PEASLEE, M. D.

None observed.

Bristol—J. M. BISHOP, M. D.

Fifteen cases, one fatal. Have given special attention, but am undecided as to cause. If the cases were very severe, think isolation would reduce the fatality throughout the state. Six fatal cases reported in town. I had five cases in one family; one escaped: I discovered no cause in the surroundings. Have known isolated cases in families. Think the disease is owing to some unusual influence in the atmosphere or surroundings which has predisposed the individual: often a severe cold is the exciting cause. Do not consider the disease so contagious as many do.

Bristol—H. B. FOWLER, M. D.

Five or six cases, one fatal. Do not think isolation would greatly reduce its fatality throughout the state. I know of no cause except that which brings influenza, common cold, sporadic cases of scarlatina, or typhoid fever. Possibly it may be of divine origin, as a reminder of our shortcomings.

Bristol—JOHN C. WHEET, M. D.

One case, recovered. In this case a younger and an older sister were with the patient, playing and sleeping in the room where he was sick. In my opinion, isolation would be of no benefit.

Brookline—ALONZO S. WALLACE, M. D.

None observed.

Canaan—GEO. E. LEET, M. D.

One case in my practice, in Orange; two cases in consultation. Think isolation would reduce its fatality in epidemics, and public funerals should not be allowed.

Canaan (Vt.) (on N. H. line)—ARTEMUS WARD, M. D.

Seven cases, five fatal. The five fatal cases were in one family, having good surroundings and in a good neighborhood. Could not determine the cause. The bodies were placed in a tomb within a few hours after death; no funerals allowed. Think isolation would greatly reduce its fatality throughout the state.

Canaan—E. M. TUCKER, M. D.

Six cases,—one fatal, the last case of six in the same family. This is the second case I have lost during a practice of more than ten years in Canaan, and this, perhaps, should be reported as a case of obstinacy, as the patient was bound to die. In the family mentioned there were instances of marked contagion. I am satisfied that by isolating every case as soon as discovered the disease could be stamped out of existence. Have always insisted upon isolation; adopted preventive treatment for those accidentally exposed, and have had the bodies buried within twenty-four hours after death.

Canaan—ARA WHEAT, M. D.

None observed.

Candia—L. E. GRANT, M. D.

None observed.

Charlestown—N. G. BROOKS, M. D.

None observed.

Chesterfield—DANIEL F. RANDALL, M. D.

None observed.

Colebrook—C. C. NORRIS, M. D.

Four cases, mild form. I consider this a contagious disease. Do not consider isolation necessary; think good sanitary condi-

tions and proper care of persons who are among the sick all that is required.

Colebrook—GUY HOLBROOK, M. D.

Six cases, one fatal; four of the cases were in Vermont, with the fatal case. In about one half the cases there have been bad sanitary conditions. Have seen marked instances of direct contagion. Have given special attention in nearly all cases as to the probable cause. In nearly every case it was due to breathing impure air and drinking polluted water; some from direct contagion. One third of the cases were under ten years of age. Most certainly do I believe that isolation would greatly reduce the number of fatal cases throughout the state. I only know of one instance where the disease was contracted by attending a funeral, and that was myself. In the fall of 1864 the disease was quite prevalent in this vicinity. The next day after my return from Hanover, where I had been during the fall attending medical lectures, a relative buried a child, and I attended the funeral and assisted in the burial. The second or third day after, I was attacked with the disease, and was considered dangerously ill for several days, and was confined to the bed for six weeks. The child whose funeral I attended was the first one in the family who died, but soon after the father and two or three children and a hired girl died with the same disease, and one of the nurses contracted the disease and lived only two days.

Concord—F. A. STILLINGS, M. D.

None observed. Think isolation and the use of disinfectants would greatly reduce its fatality throughout the state.

Concord—JOSEPH CHASE, JR., M. D.

No case of true diphtheria. Have had many cases of follicular tonsilitis, but no case of real diphtheria.

Concord—JULIA WALLACE RUSSELL, M. D.

One case, recovered. Gave special attention as to cause, and attribute it to non-attendance to personal hygiene. Think isolation would greatly reduce the number of fatal cases throughout the state.

Concord—G. P. CONN, M. D.

Six cases, none fatal. Bad sanitary conditions in all cases. Five sixths of the cases occurred in children under ten years of age. Isolation would help to greatly reduce its fatality throughout the state. Public funerals are generally discouraged through the state.

Concord—GEORGE COOK, M. D.

Five cases, two fatal, of the croupous form. Have given special attention as to cause: do not know what starts first case; others due to contagion. All except one under ten years of age.

Birch Dale (Concord)—LUCINDA S. HALL, M. D.

None observed. In my opinion diphtheria is first produced by bad sanitary conditions (as badly constructed vaults, drains, cesspools, polluted water, and decaying vegetable and animal matter), aided by indigestible food.

Conway—S. A. EVANS, M. D.

None observed. None in town to my knowledge. Think isolation would greatly reduce its fatality throughout the state.

Conway—DANIEL WATSON, M. D.

Seventeen cases, none fatal. Cannot say how many cases in town. Have seen marked instances of direct contagion. Twenty-five per cent. occurred in children under ten years of age. In my opinion isolation would greatly reduce its fatality throughout the state. Think public funerals ought not to be allowed.

Cornish Flat—GEORGE W. HUNT, M. D.

None in this town. I had two cases in Meriden (Plainfield). These cases were clearly traceable to direct contagion. Both were under ten years of age. In my cases no funeral services have been held at the time of burial, but several weeks after in a church. Have not seen it spread through schools, for they have been closed as soon as a case has appeared in or near the school. I regard diphtheria as being eminently contagious, and

it should be so impressed upon the public mind. All cases should be isolated as much as or more than small-pox, for people will give that a wide berth even when protected by vaccination. Where isolation has been secured I have limited the disease to one house.

Deerfield—G. H. TOWLE, M. D.

None observed; none in town. Think isolation important. There has been but one true diphtheretic disease in town for fifteen years: that was a case of diphtheretic croup, and proved fatal.

Dover—M. C. LATHROP, M. D.

None observed.

Dover—C. A. FAIRBANKS, M. D.

None observed.

Dover—SMITH & CHAMBERLAIN, M. D.'s.

None observed.

Dover—H. R. PARKER, M. D.

Three cases, none fatal. Am unable to state the cause. Think isolation would somewhat reduce its fatality throughout the state.

Dover—W. B. SULLIVAN, M. D.

None observed.

Dover—T. J. W. PRAY, M. D.

One case, not fatal. I have no doubt but bad sanitary conditions (like badly constructed vaults, drains, cesspools, polluted water, decaying vegetable and animal matter, etc.) are often factors in producing this disease. Cellarless houses, or rooms having no cellar under them, are often visited by the disease. Three fourths of my cases occur in children under ten years of age. Think isolation would greatly reduce its fatality throughout the state. There is no doubt but schools are often a fruitful means of its spread.

Dover—EDWARD S. BERRY, M. D.

None observed.

Dover—JOHN R. HAM, M. D.

Four cases, none fatal. Could not trace any of my cases to bad sanitary conditions. Have given special attention as to cause; know of no other than the "*contagium vivum*" of diphtheria. Decidedly, isolation would greatly reduce its fatality throughout the state. I have seen a case of diphtheria in a woman who kissed the corpse of a little niece at the funeral. The disease showed itself in her in less than a week, and in a neighborhood where there were no other cases.

Dover—JAS. H. WHEELER, M. D.

Quite a number, cannot tell exactly how many; none fatal. Have seen marked instances of direct contagion; believe it to be by taking the breath. Believe it to be endemical. While the larger proportion of cases are in children, age does not limit it. Think isolation would greatly reduce its fatality throughout the state. Believe it to be communicable from child to child. My idea is that it is endemical and epidemical, whether from cold or from unfavorable sanitary surroundings.

Dover—CARL H. HORSCH, M. D.

One case in my practice, not fatal. Twelve cases in town, one fatal. In my case could discover no other cause than that she worked hard and took cold. Consider isolation one of the most important measures against the spreading of any contagious and infectious disease. The number of cases occurring in Dover was received from the physicians.

Effingham—J. M. LEAVITT, M. D.

Not one case in my practice, none observed in town. My experience has been, the more filth the sooner fatal. Marshes which are nearly dry in summer and wet in autumn are favorable to the disease; at least there will be plenty of diphtheria among the families who live near, especially near the level, of this bog, and are filthy. Believe isolation would greatly reduce the num-

ber of fatal cases throughout the state. Order funerals to be strictly private. If a scholar is allowed to associate intimately with other scholars, especially exchanging breaths, there will be as many cases as scholars thus associating. This is a healthy locality, seldom visited by diphtheria. We are among the earthly blest, in this respect.

Enfield—VALENTINE MANAHAN, M. D.

Six cases, one fatal; all in town. Five of these cases were traced to bad drainage; in one case could discover no cause. The one case proved fatal in twelve hours after I saw it. The sink-spout opened into a wooden box under floor, and discharged into manure heap under the barn, about twenty feet from the road.

Epping—F. W. SPAULDING, M. D.

Fourteen cases, none fatal; six in town, eight in Fremont. In some cases thought it was caused by filthy surroundings. Several cases occurred in one family; still it may not have been owing to contagion, as what caused it in one case may have caused it in the others. Twenty-eight and one half per cent. occurred in children under ten years of age. Think isolation would greatly reduce its fatality throughout the state. Do not approve of public funerals of persons dying of this disease. Most of the above cases were of a mild character.

Epping—A. C. BUSWELL, M. D.

Two cases, not fatal. My most severe case occurred in a tenement over a store, the back windows of which were directly over a stable and a low, dirty ditch.

Epping—H. B. BURNHAM, M. D.

None observed; know of none in town. I would isolate every case, but have doubts about its being so very contagious, and do not think it would greatly reduce the fatality. Have seen, during the past year, several cases of sore throat, termed by some ulcerated sore throat, cankerous sore throat, follicular tonsillitis, and diphtheretic sore throat, and by many diphtheria. Diphtheria is a grave constitutional disease with a local product

generally in the throat,—not always, however; and the disease so often confounded with and by many termed diphtheria is only a local disease with a local exudate which is readily amenable to treatment, and would undoubtedly recover of itself alone in a short time. I saw but one case of the genuine disease during the past year, and that in consultation. The local or throat lesions were slight, the constitutional grave: the patient died.

Epsom—M. F. SMITH, M. D.

One case, not fatal.

Epsom—DANIEL LINCOLN LOCKE, M. D.

None observed; none in town. Think isolation important in this disease. In one case from out of town the corpse was not allowed to be seen.

Exeter—EZRA BARTLETT, M. D.

None observed.

Exeter—EDWARD O. OTIS, M. D.

None observed.

Exeter—WM. G. PERRY, M. D.

Two cases; none others observed. Could not trace these cases to any bad sanitary conditions; of course I have given special attention as to cause. Am not certain that isolation would greatly reduce its fatality throughout the state. Public funerals should not be allowed.

Farmington—JOHN YOUNG, M. D.

None observed.

Farmington—H. P. WHEATLEY, M. D.

Two cases, neither fatal; both in North Durham. Attribute the disease to poison arising from neighboring swamp. Think isolation would greatly reduce its fatality throughout the state.

Farmington—D. T. PARKER, M. D.

None observed. Do not know as isolation would greatly decrease its fatality throughout the state. Cannot say that public funerals make much difference.

Fitzwilliam—EDWIN G. ANNABLE, M. D.

None observed; none in town. Think isolation would greatly reduce its fatality throughout the state. Think public funerals are the means of spreading the disease.

Fitzwilliam—A. R. GLEASON, M. D.

None observed; none in town.

Francestown—THOS. E. FISHER, M. D.

None observed. Isolation would greatly reduce its fatality throughout the state.

Francestown—H. S. HUTCHINSON, M. D.

None observed.

Gilsum—I. A. LOVELAND, M. D.

None observed. Think isolation important.

Gilmanton—NAHUM WIGHT, M. D.

Eight to ten cases, two fatal; all in town. To some extent epidemic; bad sanitary conditions had much to do with producing the disease and adding to its severity. None were under ten years of age. Think isolation would greatly reduce its fatality throughout the state. Funerals should be as private as possible.

Gilmanton Iron Works—S. A. TAYLOR, M. D.

None observed; none in town.

Goffstown—FRANK BLAISDELL, M. D.

None observed.

Goffstown—ALONZO F. CARR, M. D.

None observed. Do not know of a case in town. As a prudential step I should forbid the attendance of children at the funerals of persons dying of this disease, under any circumstances whatever, and I should advise adults to use cautionary measures as regards ventilation. The casket should be closely sealed by some person previously exposed to the disease. The channels of its communication are not all known yet; caution is wise.

Goffstown Centre—CHARLES F. GEORGE, M. D.

There have been no cases of diphtheria in my practice during the past year. I am strongly of the opinion that the disease is contagious, and that isolation in every case would greatly reduce the spread of the disease.

Goshen—F. P. JONES, M. D.

None observed. Several cases of tonsillitis.

Grantham—F. B. PERKINS, M. D.

Two cases, not fatal—both in Croydon; one case was quite severe. Most certainly would advise isolation when the disease appears in malignant form; mild cases observed have not appeared to be specially contagious, although I advise isolation in every instance, as I do not know how soon a mild case may prove malignant.

Greenfield—S. H. PARTRIDGE, M. D.

None observed. None in town. My opinion, based upon years of experience and observation, is, that isolation of the patient, and abandonment of the localities where it makes its appearance till time and change of season disinfect the premises, would well-nigh eradicate the disease.

Greenville—GEORGE F. MUNSEY, M. D.

One case, not fatal. In the early fall of 1882 I had a very severe case of diphtheria in one of our tenement-houses. The dejections, etc., were thrown down the vault, and not removed in the spring, and the sick-room was not cleansed in any

manner. The family moved out in June, 1883, and another family moved in immediately, with two children, aged respectively four and seven years. The family slept in the room where the patient was sick the season before with diphtheria, and the children had a play-house in the shed by the side of the vault (the vault being a room partitioned off in the building). In four days the older child was taken down with what I diagnosed as diphtheria, and subsequently three other physicians called in consultation concurred with my diagnosis of diphtheria. In seven days afterwards the other child was taken sick, and in due time I pronounced her malady scarlet fever, and called in council an old physician of large experience, who unhesitatingly pronounced her case scarlatina anginosa. The patient died on the eighth day. The one with diphtheria recovered. There were no cases of diphtheria or scarlet fever in the village at the time, and none afterwards that could be connected with these cases in any way.

Greenland—JOSEPH W. ODELL, M. D.

Five cases, three fatal—all in North Hampton. Am doubtful as to cause. Think isolation important.

Greenland—WILLIAM O. JUNKINS, M. D.

Forty-eight cases, none fatal; twelve of them in town, thirty in Stratham, Newington, and North Hampton, six in Rye. I believe one third of the cases were caused by badly constructed vaults and drains, and polluted water. In many instances have failed to find any cause. Think isolation would greatly reduce its fatality throughout the state. All my cases, with but three exceptions, have been quite simple; these were followed with sequelæ.

Great Falls—LOUIS L. ANGER, M. D.

Three cases, none fatal. Two of the cases were children. Think isolation important.

Hanover—WILLIAM T. SMITH, M. D.

None in my practice. Isolation would greatly reduce the fatality throughout the state. Some interesting facts bearing

on the contagiousness of diphtheria have recently come to my knowledge. In October last a child recently taken from Keene to the north part of Royalton, Vt., was attacked with diphtheria. It was presumed that the contagion was brought with it, as there was no diphtheria in Royalton. A physician from the village of South Royalton attended it. The child died. The child's mother had the disease, and recovered. The doctor's family consisted of himself and wife and three children. He took the disease, and his youngest child, five months old, was also taken sick. His other two children were sent away. His wife, worn with watching, came down with typhoid fever, and it was necessary to put the baby in other hands; the child had no appreciable throat symptoms, but had a bad sore on its toe. Its father did not regard this as diphtheretic, and when a neighbor offered to take it home he allowed her to do so. The family of this neighbor, Mrs. H., consisted of herself and husband, two boys, of seven and nine years, and a nursing child. In a few days the nursing child had diphtheria, and died. One of her boys and her husband and herself had it, and recovered. The other boy was just recovering from a fever; he escaped. The baby was then handed over to Mrs. S., who lived on a hill-top two miles out of the village. Mrs. S. and her husband lived alone, but they called in a young woman, Miss L. S., to take care of the child. In a few days she had diphtheria, and went home. She lived out of the village in another direction; her family consisted of her father and mother, herself, and three brothers. Her mother and one brother took the disease; her father and two of her brothers escaped. Some time after she gave the disease to another person of whom I will speak later. To return to the virulent baby on the hill-top. Mr. and Mrs. S., although they were not sick, had lost their nurse, and passed the baby on to Mrs. D., living in the village. In Mrs. D.'s family were her husband, herself, and three children, the eldest child a hearty young man of eighteen, the next a girl of sixteen, and a boy of eight. These three children sickened within a day or two of each other, and all three died in four or five days. Mrs. D.'s husband did not take the disease. The innocent cause of all this trouble was then taken away to Vershire by his grandfather, and recovered. These

events occurred in October and November. Miss L. S., previously referred to, had a serious illness, but by December 1st she was able to go away on a visit to another town; she had paralysis of the palate and recti muscles. She remained away two weeks. Immediately after her return, Miss H., a young lady friend who had come to town during her absence, visited her, spending two or three nights with her. Five days after, this young lady, Miss H., was taken sick with sore throat and diphtheretic symptoms; in three days she was much better, and in ten days, as she felt quite well and had been told that her sore throat was not diphtheria, she went to Tunbridge, the next town to Royalton on the north, to the family of Mr. C. S. In this family there were four persons, a girl of sixteen, a boy of eleven, and the father and mother. In five days after Miss H.'s arrival the daughter was attacked with diphtheria, and lived only three or four days. The neighbors kept away, and the funeral was private. The boy came down next, then the mother and the father; these three are now recovering (Feb. 29, 1884). I have not inquired whether Miss L. S. gave the disease to any of the friends among whom she visited during the first half of December, or whether the baby caused any cases in Vershire, where he was finally carried. In the town of Royalton the contagion reported from Keene was carried by the doctor to his home, and thence by the baby into every family that took him in, and finally from one of his nurses, Miss L. S., to the family in Tunbridge, to the inexpressible grief of the unwitting bearer. Outside of this line of contagion there was not a single case, and there has been none since. These facts I had from several sources, but the details chiefly from Dr. W., of South Royalton.

Statement of the Progress of the Contagion.

Source.	Families exposed.	Cases.	Deaths.
Child from Keene.		Mother.	
		Doctor.	
Doctor.	Mother.		
	Three children.	Baby.	
Baby (Doctor's).	Mr. H.	Mr. H.	
	Mrs. H.	Mrs. H.	
	Two boys.	One boy.	
	Nursing baby.	Baby.	Baby (Mrs. H's).

Baby (Doctor's).	Mr. S.		
	Mrs. S.	Miss L. S.	
	Miss L. S.		
Baby (Doctor's).	Mr. D.	Boy of 18.	Boy of 18.
	Mrs. D.	Girl of 16.	Girl of 16.
	Boy of 18.	Boy of 8.	Boy of 8.
	Girl of 16.		
	Boy of 8.		
Miss L. S.	Mr. S.	Mrs. S.	
	Mrs. S.	One son.	
	Three sons (adults)	Miss H.	
	Miss H. (visitor).		
Miss H.	Mr. C. S.	Mr. C. S.	
	Mrs. S.	Mrs. S.	Girl.
	Girl of 16.	Girl.	
	Boy of 11.	Boy.	

Hanover—C. P. FROST, M. D.

None observed.

Hampton—WILLIAM T. MERRILL, M. D.

One case, recovered ; the disease was contracted out of town. From past experience isolation would not greatly reduce its fatality throughout the state.

Haverhill—M. D. CARBEE, M. D.

Four cases, none fatal ; all in town. In three cases bad drainage was the probable cause ; in the other case it was probably caused by exposure. Isolation would greatly reduce its fatality throughout the state ; think public funerals should be prohibited. Have seen several instances of its spreading through an entire school-district. These cases were all mild.

Henniker—LEONARD W. PEABODY, M. D.

None observed ; think isolation would greatly reduce the fatality throughout the state. In my opinion, badly ventilated dormitories, allowing children to sleep in rooms having two or three beds, and two or three in a bed, may be put down as a fruitful cause of the disease.

Henniker—HENRY A. WATSON, M. D.

None observed.

Hill—W. F. BALDWIN, M. D.

None observed.

Hillsborough Bridge—MARCELLUS H. FELT, M. D.

None observed.

Hillsborough Bridge—A. C. BURNHAM, M. D.

Have not seen a case during the past year, and have not heard of a case.

Hinsdale—M. C. DIX, M. D.

Nine cases, one fatal. Fourteen cases in town, three fatal. Bad sanitary conditions have been a prominent factor, as regards severity, in all cases save two. Have seen marked instances of direct contagion. Six of my cases were directly traceable to contagion or infection; in remaining cases am undecided as to cause. Most emphatically isolation would greatly reduce its fatality throughout the state. Would positively object to public funerals. Had three of the nine cases occurred in families other than the most intelligent, I have no doubt but we should have experienced a fearful epidemic in our school. These cases were the only ones of our pupils who contracted the disease, were seen early, the parents were amenable to reason, and consequently perfect isolation of the patients was secured.

Hopkinton—GEO. C. BLAISDELL, M. D.

Thirty-five cases, none fatal; all in this town, and very largely confined to the village of Contoocook and immediate district. Have not been able to trace a single case to bad sanitary conditions. Have seen cases follow from an attack of one member of a family. Have given very close attention, and believe the cause to be atmospheric. Not more than two or three children were affected. In a malignant case isolation would be advisable. Public funerals should not be allowed.

Hopkinton—G. H. POWERS, M. D.

Four cases, one fatal; all in town. The first case occurred in a person who occupied a room under the window of which sat a tub that received the baby's soiled napkins, and was probably caused by breathing air contaminated by decaying fecal matter; this case was fatal. The other three cases followed from this. Isolation in the house, but not otherwise, would probably reduce its fatality throughout the state.

Hudson—D. C. SMITH, M. D.

Six cases, none fatal; all occurred in Windham, and were doubtless caused by badly constructed cesspools and imperfect drainage. All were children under ten years of age. Think isolation important.

East Jaffrey—O. H. BRADLEY, M. D.

None observed.

Keene—GARDNER C. HILL, M. D.

Forty-one cases, none fatal; thirty-eight of them occurred in this city, and three in adjacent town. Have not been able to trace a single case to bad sanitary conditions. They have been in all parts of the city, from elevated to low and damp places. Have seen marked instances of direct contagion. Think isolation would greatly reduce its fatality throughout the state; have been very particular in regard to isolation. Perhaps fifty per cent. were children under ten years of age.

Keene—GEO. B. TWITCHELL, M. D.

Fifteen cases, two fatal from the trachea becoming involved. In all but two cases my patients were in families having very bad sanitary conditions—Irish, German, and French. The oldest was nineteen, and the youngest three. Probably fifty per cent. were under ten years of age. Do not think isolation would greatly reduce its fatality throughout the state. I have seen single cases in large families. Have seen four down within twenty-four hours. I believe it to be infectious, but not contagious.

Keene—W. R. DUNHAM, M. D.

Five cases, none fatal. Possibly two cases might be due to bad vaults, one to contagion; it was difficult to find a satisfactory cause in the other two. Four cases were children under ten years of age; one case fourteen years old, very severe. Should object to public funerals.

Keene—GEO. W. FLAGG, M. D.

Ten cases, none fatal. In four cases, occurring in one family, an obstructed drain may have been the cause. Seventy per cent. were children under ten years of age. Isolation, if complete, would greatly reduce its fatality throughout the state. Numerous cases of peculiar white *angina*; every appearance of membrane, but unstable, disappearing in two or three days, or less; quick convalescence, no paralysis. One of the above cases, a boy nine years old, had complete aphonia for three days; finally recovered.

Keene—S. M. DINSMORE, M. D.

Ten cases, one fatal. Probably eighty per cent. under ten years of age. There is no doubt in my mind but isolation would greatly reduce its fatality, and this opinion is based upon a careful observation of more than a hundred cases which have occurred in my practice during the last twenty years. Believe that almost always the origin of diphtheria can be traced to some local cause. It is thought by our most careful sanitarians, that the Waring system of sewerage, completed in our city the past autumn, will greatly reduce this class of diseases.

Kingston—THOS. O. REYNOLDS, M. D.

No cases have occurred during the past year. Have not seen a case of well marked diphtheria for a year in my practice. Many cases of inflamed throats, which appeared like the first of an attack of diphtheria; some seemed to be gathering up *débris* for an exudation, but all aborted (?). Saw two fatal cases, as counsel, in Newton, when within a few hours of death. Kingston and vicinity have for fifteen years, to my personal knowledge, been peculiarly prone to diphtheria. I have had as many

as twenty-one cases at a time. Kept a clinical register of cases during my first few years here: one hundred and twenty-one cases are thus recorded. Have tried hard to discover the cause. My opinion is, that it is due to contagion and infection from a complication of probable terrestrial effluviæ not yet known or understood. Have seen marked cases of direct contagion. Think isolation would greatly reduce its fatality throughout the state, because it would reduce the number of cases. No instance where the disease was communicated by a cadaver; if the disease spreads from a funeral, it is because of the local infected apartments, or the local prime cause. Diphtheretic children are not allowed in school; were they, undoubtedly their presence would propagate the contagion.

Laconia—T. S. FOSTER, M. D.

Not very many cases, mostly mild. Think the cases nearly all owing to bad sanitary conditions. Hardly think isolation would greatly reduce the number of fatal cases throughout the state while so many existing causes remain. Have seen marked instances of direct contagion. Two interesting fatal cases occurred in the adjoining town of Gilford in 1881; they occurred in a farmer's family of six persons. They had all been troubled for months previous with a feeling of lassitude, weakness, sore throat, sores on hands, etc., indicating a bad condition of the blood. The daughter, aged sixteen, was taken with diphtheria the first of July; case was well marked, throat extensively ulcerated and swelled. Under tonic and stimulant treatment she rallied at first, but soon failed, and died in three weeks. The youngest boy, aged three years, began to fail, or rather to lose his appetite, soon after the girl was attacked; was irritable and troublesome, though about the house and out of doors every day. He had a bad diphtheretic sore on one of his fingers, following a cut, also one on his foot, but at no time any sore throat or inflammation; he died suddenly of paralysis of the heart, forty-eight hours before his sister. All the others, excepting the mother, had it in turn, and were very sick, but recovered. I contracted the disease, as I believe, from the girl's breath, and was very sick for a few days, but made a rapid and perfect recovery. In looking for the cause, I found an old

plank sink-drain which formerly carried the water some distance under ground to a gully, which had decayed and caved in, retaining the greater part of the drainage from the sink. The well was within two rods of the sink-spout, the soil sandy and porous. I had the old drain dug up, and the contents carted off: the odor was very offensive. These cases are of interest, first, as their zymotic origin was clearly demonstrated; second, that in one of the fatal cases there was no soreness or local manifestation in the throat; third, that in my own case I contracted the disease through respiration, confirming in my own mind my previous belief that diphtheria, or its active principles, may enter the system in two ways, viz., through the circulation or through respiration. In the former case it may progress to a fatal termination without manifesting itself in the throat or fauces; in the latter, always attacking the throat first, obviously modifying the treatment, provided the latter class of cases are seen in their earliest stages.

Laconia—R. W. WILEY, M. D.

Two cases, both recovered. Have not seen marked cases of direct contagion during the last year. Found bad drainage in one case. The other case could not trace. Patient came home from a visit, and was taken sick. Think isolation would greatly reduce its fatality throughout the state.

Lake Village.—O. W. GOSS, M. D.

None observed.

Lancaster—FRANK SPOONER, M. D.

None observed.

Langdon—C. M. LUFKIN, M. D.

One case, recovered. No traceable cause.

Lebanon—T. H. CURRIE, M. D.

Have not seen a severe case during the past year. Have not heard of a death from this disease in town. In years past have seen marked instances of direct contagion. Forty years' experience convinces me that isolation would greatly reduce its

fatality throughout the state. I have made it a practice to burn sulphur in the room and other parts of the house as soon as called to a case. That, in my opinion, will destroy any contagion.

Lebanon—J. A. DAVIS, M. D.

None observed; none that I know of in town. Have never been able to trace this disease to any cause. Think isolation would greatly reduce its fatality throughout the state.

Lempster—J. N. BUTLER, M. D.

Two cases, one fatal, both in town. Have not seen marked instances of direct contagion. Always give special attention as to the cause, but in these cases could discover none. Both cases were under ten years of age. Think isolation should be carried out as far as possible. The first case came on gradually; the parents did not realize the danger, and I was not called till within a few hours of death. The other case was in a family just across the way, using water from the same well. The child recovered.

Lisbon—C. H. BOYNTON, M. D.

None observed. There have been numerous cases of tonsillitis, which in some instances may have been called diphtheria; but they had none of the constitutional symptoms of diphtheria, and recovered in a short time. Think there have been no cases in this or the adjoining town.

Lisbon—GEO. A. MARTIN, M. D.

None observed. Feel confident that I have seen marked instances of direct contagion. Should feel it to be my duty to isolate all cases as much as possible. Am opposed to public funerals in such cases.

Littleton—T. E. SANGER, M. D.

None observed in town. One case in Bethlehem. This case was a table-girl. House all right in every respect. Death occurred forty-eight hours after first complaint. A bureau drawer was found full of decayed and decaying *débris* of apples,

pecans, bananas, and other fruits covered with mould. She was treated by a New York physician, who reported the above to me. Isolation would greatly reduce its fatality throughout the state.

Littleton—HENRY L. WATSON, M. D.

No well defined case. Do not know that bad sanitary conditions have had any effect. Have not seen marked instances of direct contagion. Think the disease very easily communicated from one child to another, and, in the event of its appearance in a school, it should be closed at once.

Littleton—F. T. MOFFETT, M. D.

Ten cases in my practice, two fatal. Three cases in Dalton. Think one of the fatal cases was caused by bad sanitary conditions. Have seen marked instances of direct contagion. Attribute the other cases to contagion. Think isolation would greatly reduce its fatality throughout the state.

Littleton—B. F. PAGE, M. D.

None in town to my knowledge.

Londonderry—EUGENE WASON, M. D.

Fifteen or twenty cases, none fatal. Bad surroundings generally. Think isolation would greatly reduce its fatality throughout the state.

Lyme—W. R. BARNES, M. D.

None observed.

Marlow—MARSHALL PERKINS, M. D.

Nineteen cases, three fatal;—eleven, with two fatal, in town; eight, with one fatal, in Stoddard. Eight of the first cases in this town occurred in a tenement-house having very filthy cellar and out-buildings. All the other cases, save one, could be traced to exposure to these eight cases. Isolation would greatly reduce its fatality throughout the state. Of the eight cases in Stoddard, five could be traced to contagion, involving, however, a range in the period of incubation of from four or five days to

as many weeks. No cause could be assigned for the other cases. It was observed that in families having a case of diphtheria, other members would have inflammation of the tonsils and adjacent parts without any diphtheretic exudation. In one instance the husband had this kind of an inflammation, and before his perfect recovery his wife had true diphtheria.

Madison—E. T. HUBBARD, M. D.

One case, not fatal. Think most of my cases are caused by bad drainage and polluted water. Think isolation would greatly reduce its fatality throughout the state.

Manchester—CHARLES COREY, M. D.

Twelve cases, none fatal. These were sporadic cases, and not caused by contagion. Cannot say that isolation would greatly reduce its fatality throughout the state. In one case a lady contracted the disease while attending her sister's funeral. I was called in consultation: patient moribund when called. In Hallsville the school was closed for a few weeks. Did not attend any of the cases. Some were fatal.

Manchester—H. C. CANNEY, M. D.

Eleven cases, one fatal. Since the disease has stayed with us the year round it has not been as severe as when it was epidemic. The fatal case was in a boy who came from some country town, and had been in the city but two days when attacked. Know of no especial cause for the disease, but it is here, and evidently here to stay. Do not think isolation would greatly reduce its fatality throughout the state.

Manchester—C. M. DODGE, M. D.

Nine cases, none fatal. Marked instances of direct contagion in one or two cases. Do not think isolation would greatly reduce its fatality throughout the state. Think the disease is no more, if as likely to be contracted from the exposure of a corpse, than from the case before death.

Manchester—C. B. STURTEVANT, M. D.

One case, aged about 18, not fatal. Do not think isolation would greatly reduce its fatality throughout the state.

Manchester—CHARLES F. FLANDERS, M. D.

Seventeen cases, three fatal, all in the city. In nearly every case there were bad sanitary conditions. There was contagion in most cases, but none especially marked. Think isolation would greatly reduce its fatality throughout the state. In one suburban school (Hallsville) of thirty odd scholars, there were thirteen or more cases of diphtheretic sore throat.

Manchester—H. DE W. CARVELLE, M. D.

Four cases. In all cases the sanitary conditions were or seemed to be good. Should think isolation would greatly reduce its fatality throughout the state. Think public funerals of persons dying of this disease are unwise.

Manchester—G. B. MOREY, M. D.

Three cases, none fatal. These cases were all in one family, in a large tenement block; did not think the sanitary conditions very good. Isolation would greatly reduce its fatality throughout the state. Object to public funerals in these cases.

Manchester—GEORGE D. TOWNE, M. D.

One case, recovered; cause not discovered. Am in doubt as to whether isolation would greatly reduce its fatality throughout the state: always isolate when possible.

Manchester—JACOB W. MOOAR, M. D.

One case, recovered. Attributed this case to exhalations from barn cellar in which were several swine. The air in patient's room was nearly as bad as in the barn cellar.

Manchester—W. W. WILKINS, M. D.

None observed. Undoubtedly isolation would greatly reduce its fatality throughout the state. There have been a number of

cases of sore throat attended with some deposit of lymph on the tonsils, which is called by the laity, and sometimes by physicians, diphtheria, but which is entirely wanting in the constitutional symptoms of diphtheria. At the commencement of each term of school I have observed an unusual frequency of this kind of sore throat; attribute it to badly ventilated and damp school-houses.

Marlborough—N. H. MERRIAM, M. D.

None observed.

Meriden—HUBERT SLEEPER, M. D.

None observed. Have seen marked instances of direct contagion prior to this season. Isolation would greatly reduce its fatality throughout the state. Diphtheria has not prevailed to any extent in this section during the past year.

Meriden—H. COOPER, M. D.

Three cases, none fatal. Two of the cases occurred in weak, anæmic children, colds being the exciting cause: the third, a student who brought the disease from home. I isolated this case immediately, and no other cases occurred in the academy. I certainly believe isolation would greatly reduce its fatality throughout the state. Have known of instances of this disease being contracted by attending public funerals.

Merrimack—WARREN W. PILLSBURY, M. D.

None observed. Think isolation would greatly reduce its fatality throughout the state.

Milford—W. H. DINSMORE, M. D.

Four cases, one fatal; three of them, with the one fatal, in town. Cases all owing to contagion. Am positive isolation would greatly reduce its fatality throughout the state. If the disease starts in a school it is almost certain to spread.

Milford—A. W. SMITH, M. D.

None observed in my practice. Am confident that I have seen marked instances of direct contagion, but think it may be

otherwise contracted. Think isolation would greatly reduce its fatality throughout the state. Have been on the board of education during the past year, and have excluded all children from the school in whose families the disease was supposed to exist.

Milton—W. F. WALLACE, M. D.

Four cases, none fatal; all in town. Bad sanitary condition was a factor in all the cases. Have seen marked instances of direct contagion. Do not think isolation would greatly reduce its fatality throughout the state.

Mont Vernon—FREDERICK CHANDLER, M. D.

None observed.

Nashua—J. N. WOODWARD M. D.

Three cases, none fatal. Think isolation would greatly reduce its fatality throughout the state. Think schools are often the means of spreading the disease.

Nashua—HENRY G. DEARBORN, M. D.

None observed. Think isolation would greatly reduce its fatality throughout the state.

Nashua—GEO. F. WILBER, M. D.

Nine cases, one fatal. Have seen marked instances of direct contagion. Isolation would greatly reduce its fatality throughout the state. Am satisfied that a part of my cases were contracted in school. I recommended that all dejections, etc., be burned at once; all handkerchiefs burned instead of washed. Another child being removed did not contract the disease. One family of four cases could not be isolated. Three of the cases were apparently due to contagion from the first, who was a school-girl.

New Boston—H. D. GOULD, M. D.

None observed; none in town to my knowledge.

New Boston—C. A. WEAVER, M. D.

None observed.

New Ipswich—FREDERICK JONES, M. D.

Two cases. Bad sanitary conditions at or near the place where the disease occurred has been the rule. I have no doubt but the germs produced by accumulations of filth in dark places where the sunlight does not enter give rise to this disease. Think isolation would greatly reduce its fatality throughout the state.

New Ipswich—FREDERICK W. JONES, M. D.

Two cases, none fatal. Have known of but four cases in town; one fatal. In one case, badly constructed vault, poor drainage, pig-sty near at hand, and in all probability polluted water, beside decaying vegetable matter, contaminated the surroundings to such an extent as to be plainly instrumental in causing or at least lending to the gravity of the disease. In the second case, water apparently pure, no cesspools, some decaying vegetable matter and manure in immediate vicinity. Attribute the cause to a germ developed under pent-up filth in places improperly ventilated, from stagnant water in dark places, and decaying animal and vegetable matter under all circumstances. Advise the isolation of each and every case, with a free use of disinfectants.

New Ipswich—F. N. GIBSON, M. D.

None observed.

Newton—F. H. MORSE, M. D.

Four cases, two fatal; all in town. The two fatal cases seemed to have originated in a foul smelling, marshy pond and sluggish stream. Direct contagion in one case. Think isolation would greatly reduce its fatality throughout the state.

Newmarket—CHAS. A. MORSE, M. D.

Three cases, none fatal. Bad sanitary conditions in all cases. Isolation would greatly reduce its fatality throughout the state.

Newport—WM. W. DARLING, M. D.

Six cases, none fatal. Isolation would greatly reduce its fatality throughout the state. Public funerals in such cases should not be allowed.

Newport—T. B. & C. A. SANBORN, M. D.'s.

No cases of true diphtheria have occurred in our practice. There have been quite a number of diphtheretic sore throats.

Newport—DAVID M. CURRIER, M. D.

Five cases, none fatal. Bad sanitary conditions have influenced the severity of the cases to a very large extent. One case occurred in the mother immediately after caring for her daughter in scarlatina. Do not think isolation would greatly reduce its fatality throughout the state.

New London—JOHN P. ELKINS, M. D.

None observed.

Northwood—J. W. PRAY, M. D.

None observed. Have noticed the spread of the disease through schools when there have been decaying vegetable matter and polluted water in the vicinity of the school. Isolation would greatly reduce its fatality throughout the state.

Northwood—C. W. HANSON, M. D.

None observed.

Ossipee—WM. H. GRANT, M. D.

None observed. Although I regard only the epidemic form as contagious, yet I think in all sporadic cases isolation should be observed, to be on the safe side.

Ossipee—M. A. HARMON, M. D.

None observed.

Pelham—A. BATCHELDER, M. D.

None observed.

Penacook—WM. H. HOSMER, M. D.

Have attended professionally some forty cases of diphtheretic sore throat within the past year; none proved fatal. Attribute

the cause to change of temperature taking place suddenly. Isolation in malignant cases would be advisable.

Peterborough—W. D. CHASE, M. D.

Seven cases, three fatal. Could not attribute my cases to bad sanitary conditions. Isolation would greatly reduce its fatality throughout the state. My cases of diphtheria occurred in various parts of the village in healthy locations, and could not possibly be attributed to bad sanitary conditions. The first cases appeared in the family of a neat and tidy farmer, whose buildings and surroundings were kept in excellent sanitary condition. But it was a singular fact that all the cases that came under my observation obtained their milk supply from this family. So general became the belief in the community that the milk from this source was communicating the disease, that the Secretary of the Board of Health, Dr. Watson, was informed of the condition of things, and requested to investigate the matter. After careful investigation, he came to the conclusion that the milk supply and the occurrence of diphtheria was simply a coincidence.*

Peterborough—J. H. MAYO, M. D.

Eighteen cases, two fatal; all in town. Attribute the cause to badly constructed drains and decaying vegetables in cellars. Isolation would greatly reduce its fatality throughout the state. Nearly all cases were of a severe type; some occurred in what might be termed badly ventilated tenement-houses, with poor drainage, but not really enough so to say it was the cause. In a few instances I found cellars unclean, that is, much decayed vegetable matter and contaminated water about the premises, but I am firm in the belief that the disease is communicated by the air; yet if our systems are not in an impressible condition we will not contract any disease, no matter if we are right over a patient sick with diphtheria or variola. But if our systems are in an impressible condition, we are very likely to contract disease if it is in the neighborhood. I do not wish it to be understood that we can do nothing to prevent it, for we can do much, but when the monster is upon us it is difficult to shake him off.

* See report elsewhere.

Peterborough—JOHN H. CUTLER, M. D.

Three cases, one fatal. Think there have been as many as twenty cases in town; four or five fatal. Attribute the cause to filthy conditions in some instances, and in some to contagion. Isolation would reduce its fatality throughout the state, to some extent.

Peterborough—CHAS. F. OBER, M. D.

Eighteen cases, one malignant case, fatal. Have heard of thirty cases in town, six fatal. Seven cases occurred in one house where the sanitary conditions were remarkably good; no cause could be assigned. In other cases there were badly constructed drains, vaults, and pig-sties, also decaying vegetable matter in cellars.

Plaistow—EDMUND B. FRYE, M. D.

None observed.

Plainfield—CHAS. C. BECKLEY, M. D.

One case, not fatal. Attribute this case to bad sanitary conditions. Isolation would greatly reduce its fatality throughout the state. My one case was Miss B——, a student at K. U. A., Meriden. As soon as she felt any soreness of the throat she was conveyed to her home in Plainfield, a distance of six miles. After her recovery I visited Meriden and examined the sanitary conditions of the place. I found the old house much out of repair, the floor leading to the students' rooms was worn through, and filth had accumulated under the boards. The windows opened in close proximity to a sink-drain that was uncovered in many places. Attached to the house was a large wood-shed, and in this a vault; this building was almost destitute of shingles. The floor was wet and mouldy, and the odor was most offensive. I have no doubt but this case of diphtheria was caused by bad sanitary conditions.

Plymouth—TRISTRAM ROGERS, M. D.

None observed. Two fatal cases in town reported to be diphtheria.

Plymouth—CYRUS K. KELLEY, M. D.

Four cases, none fatal. One case was imported from Boston. Direct contagion in two cases. Cannot say that isolation would greatly reduce its fatality throughout the state.

Plymouth—ROBERT BURNS, M. D.

Three cases, one caused by an opened sewer. The other two cases were in Holderness, one half mile from this village. The first case there was imported; patient taken sick immediately after reaching the town. The second case, in the same house, was that of a young lady who nursed the first one. This house was provided with drain-pipes most thoroughly trapped, and ventilated into hot flues. We have but little drainage in this town, and what there is is of the poorest kind.

Portsmouth—D. W. JONES, M. D.

Nine cases, none fatal. Attribute the cause to germs of a specific poison. Think isolation would reduce its fatality somewhat. Public funerals of persons dying of the malignant form of this disease should not be tolerated. Think the disease spreads more from epidemic influence than by direct contagion. Scientific research has demonstrated the existence of a bacterium—whether standing in the relation of cause to effect has not been proven; my opinion is, that it does. The great vitality of the spores allows them to become hidden and preserved in the most unthought-of places, and under favorable conditions producing its parent bacterium, and may thus become the starting-point of an epidemic.

Portsmouth—J. W. PARSONS, M. D.

Nine cases, one fatal from diphtheretic croup. Investigated as to the cause, and attribute it to colds. All were children under ten years of age. Think it doubtful if isolation would greatly reduce its fatality throughout the state.

Portsmouth—F. L. BENEDICT, M. D.

Nine cases. Attribute all my cases to bad drainage and cess-pools. Have seen no marked instance of direct contagion.

All were children under ten years of age. Isolation would greatly reduce its fatality throughout the state. From observation, I conclude that the disease springs from a common cause rather than from contagion, when more than one case occurs in a school.

Portsmouth—N. L. FOLSOM, M. D.

Five cases, none fatal. Do not think isolation would greatly reduce its fatality throughout the state.

Raymond—TRUE M. GOULD, M. D.

Two cases; one in town, one in Fremont. Think isolation important. One of the cases, which was fatal, occurred in a farmer's family. The child was sick two weeks. The buildings are on high ground. In front of the house and about one hundred rods distant is a large meadow that is flowed most of the time, but was drawn off a week or two before the sickness. The case which occurred in Fremont, also fatal, was a French child five months old; lived but two days after taken sick. Sanitary conditions not very good.

Rindge—W. H. ALDRICH, M. D.

None observed.

Rochester—F. E. WHITNEY, M. D.

None in my practice. Think isolation would greatly reduce its fatality throughout the state.

Rochester—JAMES FARRINGTON, M. D.

Eight cases, none fatal; found no satisfactory cause. Most assuredly isolation would greatly reduce its fatality throughout the state. In past years have known quite a number of cases contracted by attending funerals of persons dying of this disease. I have known it to spread through most of a school-district located in a healthy part of the town, with no other cases in town. I then thought it originated in vaults that had not been properly cared for.

East Rochester—STEPHEN YOUNG, M. D.

Eleven cases, two fatal. Six cases were probably caused by decaying vegetable and animal matter. The contents of the vaults had been spread on the ground near the house where these cases occurred. Isolation would greatly reduce its fatality throughout the state.

Rollinsford—FRANK E. BRIGHAM, M. D.

None observed.

Rumney—A. C. HALL, M. D.

One case, not fatal. It is doubtful if isolation would greatly reduce its fatality throughout the state.

Salisbury—JOHN J. DEARBORN, M. D.

None observed.

Salmon Falls—W. B. MACK, M. D.

None observed.

Sanbornton—EDWARD ABBOTT, M. D.

None observed.

Seabrook—D. W. COLCORD, M. D.

Ten cases, none fatal. Think the cases this year have been due to atmospheric changes. The isolation of every true case of specific diphtheria would greatly reduce its fatality throughout the state. I have included all cases where there was a croupous membrane on the tonsils. My only cases this year have been anginas of moderate intensity. Do not think the less severe cases are very contagious, but the severest forms I believe to be quite infectious. Have observed formerly that where children have died, the parents, as well as other members of the family, were attacked with a membrane on both tonsils, but yet were able to be about the house. However, I believe in isolation.

Somersworth—ALVIN JENKINS, M. D.

Not a single genuine case; think there has been none in town. Think isolation would greatly reduce its fatality throughout the state.

Springfield—D. P. GOODHUE, M. D.

None observed. Think isolation would greatly reduce its fatality throughout the state.

Strafford—H. C. COBURN, M. D.

None observed. Not a case in town to my knowledge. Last spring there were many cases of sore throat without the deposit or membrane.

Strafford—N. C. TWOMBLY, M. D.

None observed; think there has been none in town. In my opinion, isolation would greatly reduce its fatality throughout the state. From former experience am of the opinion that all physicians who are called to deal with this disease should isolate every case as soon as discovered, and in case of death give public notice, and peremptorily interdict all public funerals as being the only safeguard against its deadly contagion.

Suncook—J. R. KIMBALL, M. D.

None observed.

Sunapee—E. C. FISHER, M. D.

Two cases, not fatal; one in Sutton, the other in this town. In one case there were bad sanitary conditions, in the other could discover no cause. Isolation would greatly reduce its fatality throughout the state.

Surry—W. H. PORTER, M. D.

None observed.

Sutton—S. N. WELCH, M. D.

One case, none fatal. Could discover no satisfactory cause. This one case was a teacher, and I insisted upon her not con-

tinuing her school, in order that the scholars might not be exposed. No other cases occurred.

North Sutton—JAMES R. SMILEY, M. D.

Not a genuine case of diphtheria during the past year. Sore throats have been common, with occasional diphtheretic deposit of small extent.

Swansey—GEO. I. CUTLER, M. D.

Ten cases, one fatal; eight cases in town, none fatal. A few of these cases may have been caused by bad sanitary conditions; others by infection or contagion. Isolation would greatly reduce its fatality throughout the state. Schools have been closed where the disease has been prevalent.

Tilton—CHARLES R. GOULD, M. D.

Eight cases, two fatal. Isolation would greatly reduce its fatality throughout the state. In one case the disease was evidently contracted at a private funeral. The crowding together of small children favors the development and spread of this or any other disease of an epidemic nature, I think.

Troy—M. T. STONE, M. D.

One case, recovered; no others in town. This case was caused by overwork and exposure. Isolation would greatly reduce its fatality throughout the state.

Walpole—W. B. PORTER, M. D.

None observed. Think there has been none in town during the year. Am very sure that isolation would greatly reduce its fatality throughout the state, and this rule should be adopted. Am positive that when it breaks out in a school, it spreads through the same, unless strict sanitary measures are put in force.

Union—JOHN E. SCRUTON, M. D.

Six cases, two fatal; only one in town; five, all in one family, in Brookfield, two fatal. Could not discover a cause. I believe in isolation. The first two cases occurred in March, the

others in April. Have seen no cases since then. Of the five cases which occurred in one family, the first was a boy ten years of age, who was just recovering from scarlet fever. A young man, from a family having diphtheria, called to see him, and held him on his lap, and I believe the disease was communicated in this manner. The boy died on the nineteenth day. A child about eighteen months old was sent away, being brought back four weeks after the house had been cleansed by burning sulphur. It had been at home three weeks when it was taken sick with diphtheria. It died on the thirty-sixth day. The mother, father, and grandfather of the child then had it; all recovered. Those cases in which I was expecting the disease, and had commenced treatment early, were of a much milder form than those in which treatment was delayed.

Walpole—GEO. A. BLAKE, M. D.

None observed.

Walpole—ABEL P. RICHARDSON, M. D.

None observed.

Warren—ROBERT E. MERRILL, M. D.

None observed. Isolation probably would reduce the number of cases throughout the state. Though diphtheria has prevailed in years past in all the neighboring towns, there have not been more than two or three cases in town for ten years. A few cases have been supposed to be diphtheria, but, if so, have been sporadic and non-contagious.

East Washington—GEORGE N. GAGE, M. D.

None observed. A large number of cases have occurred at the centre of this town, but cannot give the number.

North Weare—R. O. WOOD, M. D.

Three cases, none fatal. Two cases caused by direct contagion. Decidedly isolation would greatly reduce its fatality throughout the state, and our laws should compel this to be done. A daughter of Mr. B., of Bridgewater, Vt., in the fall of

1880, died with diphtheria (malignant type). The funeral was attended by his neighbors and friends, and among others was a Mrs. M. and family, who were intimate friends. Mrs. M. assisted in dressing the child, etc. If my memory serves me, Mrs. M. and three of her children contracted the disease, and all the children died. Five other children and persons took the disease at the funeral, but all recovered except one.

Wentworth—F. A. DURKEE, M. D.

None observed.

Westmoreland—G. W. CHAMBERLAIN, M. D.

One case, recovered. Isolation would greatly reduce its fatality throughout the state.

Whitefield—GEORGE H. MORRISON, M. D.

Four cases, one fatal. The fatal case was a child about two years of age. Think it was caused by bad sanitary conditions. Think isolation very important.

Whitefield—J. L. MCGREGOR, M. D.

None observed.

Whitefield—GEORGE S. GOVE, M. D.

None observed. Isolation would greatly reduce its fatality throughout the state. Believe schools are the cause of spreading the disease in two ways,—first, by mild cases attending as sore throats; second, by those who have had the disease returning to school too soon.

Wilton—GEORGE W. HATCH, M. D.

None observed.

Wilton—J. FLEEMAN, M. D.

Three or four cases, none fatal; one in town; two in Lyndeborough, Vt. Isolation would reduce its fatality throughout the state.

Winchester—WEBSTER O. HARDY, M. D.

One case. Generally if one member of a family has it, others will have a touch of it. There ought to be some law to prevent scholars attending school who have the disease. One scholar attended school with breath so fetid that the scholar next him was obliged to change his seat.

Winchester—GEORGE W. PIERCE, M. D.

Twelve cases, none fatal. It has been epidemic in its nature. Prompt removal from diphtheretic locality would undoubtedly mitigate the severity in many cases. My cases have all been in families where, both from taste and principle, the best sanitary regulations were secured. Each case was unmistakable diphtheria,—eight of them severe.

Woodsville—C. R. GIBSON, M. D.

None observed in my practice. One case in town.

Wolfeborough—N. H. SCOTT, M. D.

None observed. Think isolation would greatly reduce its fatality throughout the state. In the last three and a half years I have seen but one well marked case of diphtheria, and have known of but three in town. I am informed that for the last fifteen years the town has been equally exempt from it.

MALARIA.

The subject of malaria has been a very interesting one in New England during the past few years, and especially have the physicians of New Hampshire looked upon it with some apprehension because of its northerly march from Connecticut into Massachusetts, and towards our own state. The report of this board, one year ago, showed that the towns in the south-west corner of the state, bordering upon the Connecticut and Ashuelot rivers, were being affected to quite an extent with malarious symptoms. The reports received during the present year from all sections of the state show that there is no longer any apprehension that New Hampshire will be invaded to any extent by

this erratic and uncertain disease. Most of the towns that reported cases two years ago, now report none, showing that there was no fixed cause at the time it was reported. The towns that have reported cases of malaria, either as intermittents, remittents, or as typho-malarial fevers, are very few, and are scattered to such an extent as to show that no general influence is producing this disease within the state. The instances that have been reported were doubtless dependent either upon local causes, or were imported cases, and even the wave which crossed Massachusetts a year ago has receded, so that it has departed from many towns in that state.

That there are conditions in some of our towns which under favorable circumstances develop a state usually denominated malaria, there is no question. The evidence is equally strong that the causes are purely local. Eight cases of ague and one of malarial fever are reported in New Boston. Eight cases are reported from Strafford. A few cases of chills and fever are reported from Swanzey. A few mild cases were observed in Manchester. Dr. Butler, of Lempster, reports four cases of typho-malarial fever, but remarks that the cases observed "seemed to be continued fevers, with the usual distinctive characteristics of typhoid." Dr. J. A. Davis, of Lebanon, reports eleven cases of malaria, and attributes the cause to defective drainage and low water. Dr. Louis L. Anger, of Great Falls, reports "about twenty-five to thirty intermittent chills and fever," but makes no comment upon its origin. A few cases are also reported from Fitzwilliam, Farmington, Charlestown, and Stewartstown. Several cases are also reported from Colebrook, concerning which Dr. Guy Holbrook of that town says,— "I attribute the cause to the many dams that have been erected on the Connecticut and its tributaries, causing large tracts of land to be overflowed. The water is kept in three ponds till late in the spring, when it is needed for running lumber; then the gates are hoisted, and the water overflows the low meadows, keeping them submerged until late in the summer, leaving upon them the decayed vegetable matter that is washed from the swamps."

Dr. C. C. Norris, of that town, also concurs in the same opinion. Several cases are reported from Conway, one case (typho-

malarial fever), which came from Kansas, proving fatal. Seven cases are reported by Dr. B. F. Page, of Littleton, and three cases of typho-malarial fever are reported by Dr. Henry L. Watson, of that town. The history of Dr. Watson's cases is given below, with a map illustrating the topography of the locality.

Case 1st.—1883, August 20. Called to Mrs. M——, 52 years old, of broken constitution, and an asthmatic for many years. The preceding winter and spring she had been confined to her house, and a part of the time to her bed, but during the summer had been able to do much of her housework. At this visit found her apparently free from asthma, but with flushed face, headache, pain in back and limbs, pulse 90, temperature $100\frac{2}{3}$, tongue white; was informed she had taken cold a few days previous. August 22, was sent for late in the evening; she had a slight chill about one hour previous, and the fever had rekindled, pulse 90, temperature 100, respiration 24, tongue white, pain much as at first visit, bowels had acted freely the preceding day, urine passed freely, and to appearance normal, a little gastric flatulency. From this time to the 30th there were no essential variations in the case. On this morning found her tongue clean, pulse 76, temperature 99, respiration a little asthmatic, no pain, no flatulency; inquired what she could have to eat; was very cheerful. Just before night her husband called and said she was feeling nicely; thought the fever had turned. About nine o'clock in the evening was summoned to visit Mrs. M——. It was thought she was dying. Found her slowly rallying from a terrible chill, which her attendants attributed to her taking cold from the evening air (but believe it was malarial). In two hours after the chill her pulse was 130, her temperature $105\frac{2}{3}$, tongue clean, red, and dry, respiration badly asthmatic, mind clear. August 31.—This morning Dr. B. F. Page was called as counsel, and concurred in the view that it was a clear case of malarial poisoning, and gave an unfavorable prognosis. Pulse 120, temperature $103\frac{1}{2}$, respiration asthmatic with cough, and a little expectoration. At 8 o'clock, P. M., pulse was 130, temperature 104, respiration about as previous night; bowels tympanitic, urine scanty and highly colored. September 1, 8 o'clock, A. M.—Bowels acted moderately in early part of night; rested considerable after twelve o'clock. Pulse 112, temperature $102\frac{4}{5}$, respiration and cough a little relieved, tongue red, glossy, and dry. 9 P. M., pulse 124, temperature 104, respiration and cough somewhat aggravated. Sept. 2, 9 A. M.—Had a bad night, pulse 120, temperature 103, respiration not improved, bowels tympanitic, tongue as last stated. 8 P. M., pulse 130, temperature $104\frac{1}{2}$, asthmatic respiration and cough aggravated, mind quite clear, bowels tympanitic and sensitive to pressure. The three following days was simply a repetition of this. Death closed the scene in the early morning of September 6.

This patient was well nursed, and well supported with suitable nourishment, tonics, and stimulants. My conclusion is, that it was a clear case of typho-malarial fever, in which the vital forces succumbed to the malarial poison.

Mrs. M—— was a very intellectual, strong-minded lady, and it served her well in this, her last sickness.

Case 2d.—Mr. M——, husband of the above-named lady, aged 53, called me to visit him September 15. Said he had "taken cold a few days before, and had taken a sweat and some physic to break it up, but a chill had caused him to send for me." Found pulse 100, and quite full, face flushed, temperature 103, respiration 20, throat sore, and a little hacking cough; pain in head, back, and extremities, very thirsty, tongue covered with a thick, white fur. September 16, 9 A. M.—Pulse 96, temperature 100 $\frac{2}{3}$, respiration 20, less pain. 9 P. M.—Pulse 100, temperature 101, respiration 22. September 17, 9 A. M.—Pulse 98, temperature 100 $\frac{2}{3}$, respiration 22, no change otherwise apparent. 9 P. M.—Pulse 100, temperature 101, respiration 22. September 18, 9 A. M.—Pulse 96, temperature 99, respiration 20; said he was better; bowels acted in the night, urine flowed freely but highly colored. 9 P. M.—Has had a very comfortable day; he thought he would rest well that night; pulse 94, temperature not taken. September 19, 9 A. M.—Pulse 96, temperature 100; had a chill towards morning. 9 P. M.—Pulse 100, temperature 102, respiration 24, tongue covered with thick, white fur, throat sore. September 20, 8 A. M.—Had a restless night; pulse 110, temperature 102 $\frac{1}{2}$, respiration 26, other conditions the same as previous evening. 8 P. M.—Pulse 112, temperature 103, respiration 26; complains of gastric distress and flatulency. September 21, 8 A. M.—Said he felt much better, vomited copiously in the night, and bowels acted freely; pulse 96, temperature 100, respiration 20. 9 P. M.—Has had a comfortable day; refuses to take tonics and stimulants. September 22, 9 A. M.—Had a chill latter part of night; all conditions aggravated, pulse 115, temperature 103 $\frac{2}{3}$, respiration 26, throat inflamed and very sore, deglutition painful, coat leaving tongue with a very red, raw surface; no other essential change; obstinately refuses tonics and stimulants. September 23, 9 A. M.—Had a restless night; conditions about the same as previous morning. 8 P. M.—Pulse 120, temperature 104, respiration 30, red, dry tongue, swallowing easier, bowels not sore or tympanitic, nervously restless; says he will not take stimulants unless they are whipped into him. His unyielding, obstinate refusal to take proper supporting remedies continued till his death, September 28.

This, like Mrs. M——'s, I consider a clear case of typho-malarial fever. This also was the opinion of my counsel, Dr. B. F. Page. Mr. M——, like his wife, was broken down constitutionally to begin with. Said, on my



first visit, he had not seen a well hour for over four months, and expressed a belief that this was his last sickness.

See rude diagram and its explanations.

The diagram of the ground floor of Mr. M——'s house shows its divisions into rooms; parlor, shows its location.

S and D, sitting and dining rooms; B, bedrooms; K, kitchen; P, pantry; D, doors; W, windows; C S, chamber stairs with front entry and cellar stairs below. O indicates the location of three wells, one being under a veranda attached to about two thirds the length of the north side of the house, and very much dilapidated. House one story, seven-feet posted, square roof, and leaked badly, and the whole in a decaying condition, and badly infested with rats; cellar under the whole, very damp; water in it to the depth of three or four inches quite often; drain so obstructed that the water would remain a long time; small timbers with boards to walk on; potato bin raised several inches from the ground on account of water—everything, as a consequence, was musty; house had to be banked to keep it from freezing, winters.

||===== This character, on the north side of the house, indicates the sink-spout and where its slops run to, which enter the ground, or evaporate. The 1 well, O, was dry; the 2 well, O, was about fifteen feet from the sink, and the water is pumped into it, but of late has been so bad that it was not used for drinking and cooking. For these purposes the water was obtained from 3 well, O, in the pasture, about one hundred feet from the sink in the house. The shed adjoins the north-west corner of the house, and the privy the north corner of the shed, and the hens were kept in the west end. The little □ squares indicate the location of dwelling-houses. On the south side of Pleasant st., about one hundred feet from the house, is the site of the old barn, yard, and hog-pen. The barn had been moved in June, I think, leaving a quantity of manure that was under it and beside it, which, after rain, by the heat of the sun, at times emitted an intolerable stench. The distance across from Pleasant to Union st. I judge to be about fifty rods, and from Pine street to Cross street, about seventy rods. The general inclination of the land to the south is such that all the swamp lands could be drained into the river. The swamp land has been cut over within two or three years, and all that was not suitable for timber or fire-wood was left to mould and rot in these water-sinks. The little ⊠ square, with a dot, shows where the fever occurred in August, September, and October, and two dots indicate a death. It will be noticed that all the cases of fever were in the immediate vicinity of the premises indicated by the rude diagram. All the fever cases but Mr. and Mrs. M——'s were treated by other physicians, who will doubtless report them. The water in pasture well is believed to be bad. Mr. M——'s hired man was taken with chills, and went home and had a severe run of malarial fever. A druggist's clerk, who boarded on Union street,

went home sick of same fever, and died. Mr. M—— hired the premises he occupied, so he was not wholly in fault for the sanitary conditions being so outrageously bad.

Dr. Frank A. Colby, of Berlin Falls, reports twelve cases, and says of the causes, "Dirty, ill-drained, poorly ventilated houses, poor water, wells and cesspools connecting, &c."

The above embrace substantially all the cases known to this board, within the state. Some of these were, undoubtedly, imported cases, while many of the others, though symptoms of malaria, could not be strictly classified under that disease. It is evident, as above stated, that whatever there is of malaria in New Hampshire to-day must come from local conditions alone. There is no prospect that New Hampshire is becoming a malarious state.

DRINKING-WATER.

SOME EXAMINATIONS INTO ITS CHARACTER.

Pure air and pure water are essential to the perfect development and good health of every individual. It may seem a paradox to say that both are paramount, but at all events neither is of secondary consideration in the economy of animal life. The physiological functions of life cannot be maintained at their natural equipoise in the countless permutations of existence, or even preponderate a long time between the varying degrees of that limited transition which is represented on the one side by perfect health, and on the other by death, without the existence of both; hence no distinction can reasonably be made between the importance of each.

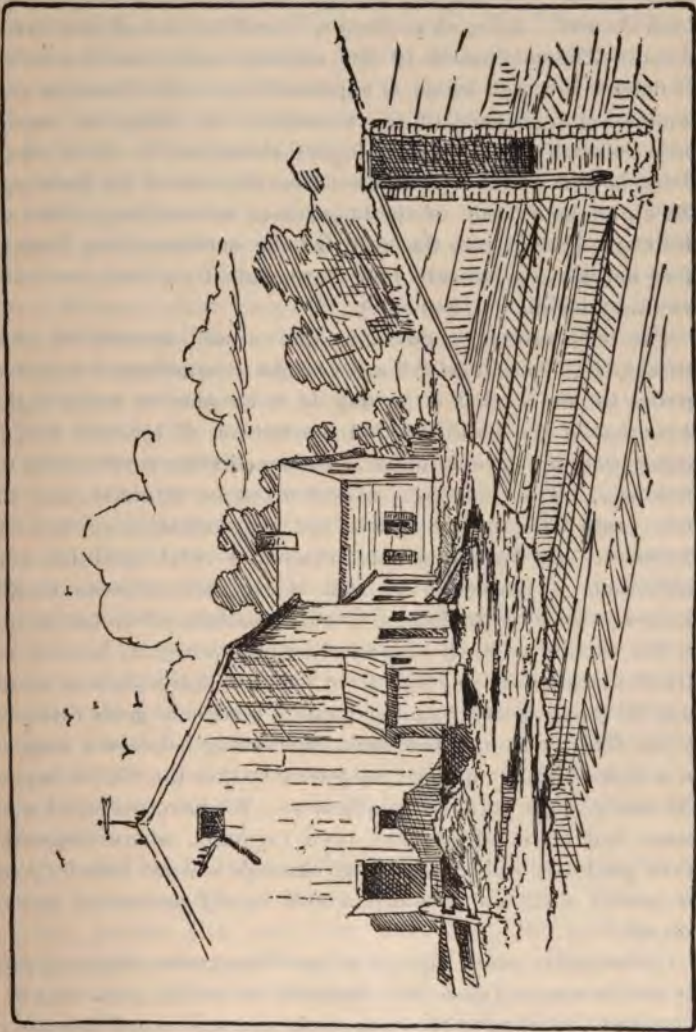
Of the neglect to make suitable provisions for each in the community or in the individual household, less attention is undoubtedly given to the subject of a pure water supply, for reasons which are obvious to any reflecting mind. The source of a water supply is generally a fixed one, at least to the extent that any change is attended with considerable expense, placing such beyond the reach of the poor, and sometimes those in less limited circumstances. These classes usually are obliged to rely upon the most dangerous source in existence, shallow

wells, even if located in a community possessing the best supply from a safe source, because their means will not admit of paying the annual water-rates; thus there are, in our cities and larger towns, where an abundance of good water has been secured, those who are deprived of its use, and are still using the water of the well dug perhaps years ago, the water of which is polluted with all kinds of filth known to civilization. Outside of our cities and larger towns, by far the greater proportion of the population throughout the state are dependent upon wells for the supply of water for domestic use. The well is generally located solely for convenience, without any knowledge or thought of topographical conditions or artificial drainage from the household or adjoining buildings.*

Frequently, among farmers who have a large stock of cattle, horses, or other domestic animals, the well is dug in the vicinity best calculated to convenience the animals, as they will require more than the household: indeed, we can call to mind two prosperous farmers who have their wells located in such a way that they have to cross the barn-yard to the farther side of the shed, underneath which is the "best well in town," where they obtained all the water used by their families. It is needless to say that some member of their families was always sick. A careful examination of the reports upon typhoid fever and diphtheria, made by many of the physicians in the state, reveals similar conditions. Frequently the wells are located lower than the buildings, and in such a position that they must serve, in part, the office of a cesspool. Such results or conditions seem to be brought about largely through an ignorance of the laws that govern drainage, and the dangers attending such a state of affairs. It should always be remembered by those about to construct a well, or already possessing one, that the soil upon which buildings are erected will become more or less polluted by the waste from the household. The degree of pollution may vary greatly, but at the average farm-house it must be so great that but a few years at most can pass before the soil will be robbed of the greater portion of its absorbent and disinfecting qualities by saturation, and then the well can no longer escape, even if it has been fortunate up to this period.

* See report of Dr. A. C. Buswell, of Epping, on Typhoid Fever.

A well is a point to which the drainage of a certain area of land surrounding it always tends. The power of the soil to hold back and obstruct the impurities which are allowed to escape



into it is soon exhausted, even upon a new site, if the amount of animal and vegetable waste is large, while a well dug upon

an old site which has been many years occupied does not for a day insure good water. There may, however, be certain sub-soil strata, known as hard-pan, or clay, that will direct the water of the soil and the surface drainage in a course away from the well; but such protection is accidental, and very exceptional. The inclination of this stratum may also be a source of danger to a well which is supposed to be safe from the contaminating influences of the household, by reason of having been located at a somewhat higher elevation; in other words, if the bottom of the well is lower than the site of the buildings, the dip or inclination of the impervious sub-soil may direct the drainage directly into the well, for the surface of the location does not always indicate how these sub-strata run, or which way they incline. (See cut.)

The only safety or guaranty that a well situated in close proximity to buildings will not become contaminated and dangerous to use is, that it be dug in a location so much higher than that of the buildings that the bottom of the well will be higher than the ground under and immediately surrounding the buildings. This, however, cannot often be attained, and will only protect the owner against the contamination of his own premises. In farming communities and rural localities, such protection is frequently all that is required, because usually there are no other buildings or other sources of contamination in the vicinity. Such supposed safety, however, should not divert the mind of any one from the fact that a well or spring may be dangerously polluted from a relatively great distance. A few feet, or even a few rods, intervening between a cesspool or a sink-drain, is in itself no guaranty that the well is beyond the reach of its pernicious influence. We have observed some cases, and many others have been reported, where impurities have gradually worked their way through several rods of loose or porous soil, and poisoned a well: many such cases are on record.

Undoubtedly many will call to mind instances where the family well is situated close to a cesspool, or within a few feet of a sink-drain, or even in the barn-yard, and still every member of the family using that water the representative of perfect health. So they might live in a city under siege, where shot and shell

were making sad havoc among its magnificent structures while theirs remained intact, yet who would say that imminent peril did not surround them? The polluted well is like the mine buried beneath the house, which may explode at any moment, a single spark sending them into eternity. The family with constitutions naturally vigorous, bearing in their blood none of the physical infirmities of hereditary transmission, will resist influences and conditions which would be fatal to the sickly and enfeebled. Individual tolerance and individual resistance vary as much as personality, and this individuality also embraces families, predisposition, idiosyncrasies, etc., being the distinguishing characteristics when studied from the standpoint of physical health. There are persons who do not contract small-pox, however often exposed, yet one of the kings of France had it twice, and died with it. Exceptions to well established rules are sometimes nearly as prominent as the rules themselves. So families will use water that is impure, and show no evidence of its subtle and insidious work, but by and by the mine explodes, the beautiful edifice is struck in the siege: typhoid fever or diphtheria has come to that household, with its possible and probable terrors.* Perchance these more savage messengers of disease do not come to that happy family. It is spared, as the woodman spares the oak, only to have its heart's blood drank up slowly but surely by the caressing and entwining mistletoe. The system is slowly poisoned, and an existence of continued debility, physical incapacity, and an almost nameless number of complaints, which are registered in the category of "poor health," are the legitimate results. The constitution is impaired, the power of resisting disease reduced, and the susceptibility to chronic as well as zymotic diseases greatly increased.

It should not be inferred, however, that bad water is the only cause of the conditions that have been described. Poor ventilation, general filth, and other unsanitary surroundings may produce the same results. There is another factor in the subject of water pollution, which gives to many a sense of security and confidence, which should be noticed, because it is an erroneous idea: this is its taste and appearance. Water contam-

* See report of Dr. H. B. Burnham, of Epping, on Typhoid Fever, in this volume.

inated to a very dangerous extent may still present an appearance of purity. It may be loaded with vegetable, mineral, and animal products which it has taken up by percolation through contaminated soil, or received direct from some avenue of drainage, and still show no indication of its character by taste, smell, or color; indeed, the water may have a sparkling appearance from the large amount of carbonic acid gas it contains, and for the same reason a more delicious taste. If this fact were generally known, many persons having wells containing such "delicious, sparkling water" would be as anxious to have its qualities tested as if it were repugnant to the senses. Taste, smell, and color, therefore, are no guaranty that water is suitable to drink.

Every physician should be able to determine the relative purity of water for his patrons; or, if he has not the time or inclination to do such work, he should insist, whenever he has reason to suspect that the water supply of the family is producing ill health, that it be examined by some one to ascertain its true character.

During the past year a great many samples of water have been sent to this office for examination. Of the large number that came from wells, over 90 per cent. were found to be polluted. The degree of pollution varied, but many contained a very large amount of dangerous organic matter. The examination of water brought into towns from springs or ponds seldom exhibited any evidence of contamination from household drainage,* but vegetable matters usually exceeded the amount found in wells. This, however, may exist to a considerable extent, and still not render the water harmful.

Below will be found some very remarkable instances of water pollution, with sufficient history in some cases to show its connection with disease. The analyses given were made by Prof. Edmund R. Angell. The following letter was received by the secretary on the day of its date:

HILLSBOROUGH BRIDGE, November 21, 1883.

TO DR. I. A. WATSON:

Dear Doctor: I herewith send you a bottle of water which I wish you to examine, and if, from your examination, you find it polluted to a con-

* The Bennington water was an exception, which will be noted farther on.

siderable extent, please have an analysis made, and report to me, with bill of expense, if any. The water is from a well used by two families, in one of which there have been three cases of typhoid fever (not in my practice). In the other there have been two cases, attended by myself,—one fatal; the other may be, the case now commencing the third week. Considerable feeling has been caused, on the part of the owner of the premises, by my saying that I think the water may have caused the disease, for, from my examination of the water, it seems to be unfit for use, and certainly the surroundings, which I cannot now take time to explain, are favorable for contamination. For the above reasons, in particular, I wish a thorough examination to be made.

Yours respectfully,

M. H. FELT.

The water received was carefully examined, so that its approximate condition was determined, but no quantitative analysis was made. The secretary wrote Dr. Felt the same day that the water was dangerously contaminated, and that he (secretary) would assume the responsibility of pronouncing the water wholly unfit for domestic use. The letter also requested that a sample be sent to Prof. Angell for analysis, and also to determine whether the prior examinations accurately represented the condition of the water. Full particulars were also requested regarding the character of the sickness supposed to have been caused by this water, and also a plan of the locality. The next mail promptly brought the following letter:

HILLSBOROUGH BRIDGE, November 22, 1883.

TO I. A. WATSON, M. D., Concord:

Dear Doctor: Yours of the 21st received. I have forwarded to Edmund R. Angell, Derry, N. H., a gallon of the suspected water, according to your directions.

I enclose a rude diagram of the two houses and surroundings. I have not had time to make actual measurements of *all* the distances, but will warrant them in all cases to be practically correct. In making plans of the houses, I intended to draw them on a scale of one eighth inch to the foot, but do not claim that they are exact.

I have numbered the houses 1 and 2. The suspected well is in No. 1. No mention is made of a well in No. 2, as they have not used their well for about three years for any purpose, except to wash floors, etc. The water from well in house No. 1 has been used by both families. There were three cases of typhoid fever in house No. 1, but not attended by me, and two in house No. 2 (one fatal) in my practice. I have tested the

Hardness, equivalent to grains of CaCO_3 , ...	8.15
Alkalinity, " " " "	4.5
Chlorine, grains per gallon, ...	7.4
Ammonia, parts per million,—	
Free ammonia, ...	3.167
Albuminoid ammonia, ...	0.235
Nitric acid, grains per gallon, ...	0.389
Nitrous acid, ...	None.
Iron, ...	Slightest trace.
Lead, ...	None.

MICROSCOPIC EXAMINATION.

Fresh water algae: *Chaetophora elegans*, &c.
Monadina, entomostraca, and tardigrada; also
 Bacteria, always characteristic of decay.

EXPLANATION AND OPINION.

The total solids are too large. The soluble solids are unusually large; but this is due partly to soluble sulphates of some metal, probably magnesium, which render the water hard. This is inferred from the fact that the hardness exceeds the insoluble solids, while it nearly corresponds with them when the hardness is due to carbonates or to sulphate of lime. The residue blackens strongly on ignition, partly in patches and partly in rings. The combustible matter is large. Because the alkalinity exceeds the insoluble solids, while it is less than the hardness, shows the presence of an alkaline carbonate, often an indication of pollution from animal matter. The large amount of chlorine points to contamination from animal sources. There is a remarkably large amount of ammonia. Says an authority,—“When the free ammonia exceeds 0.08 parts per million, it almost invariably proceeds from fermentation of urea into carbonate of ammonia, and is a sign that the water in question consists of diluted urine in a very recent condition. In these instances the water will likewise be found to be loaded with chlorides.” Nitric acid points to animal matter. *Monadina* occur “in animal and vegetable infusions in decomposing water, and especially amongst decaying fresh water algae.” Tardigrada, water bears, are found in “stagnant water amongst water plants, in wet moss, and even in the gutters of houses, from whence they may be washed into cisterns.” This is very bad water. Its chief source of pollution seems to be from animal matter, but it is not free from vegetable impurity.

EDMUND R. ANGELL.

Derry, N. H., November 26, 1883.

nished another sketch, which is the one here represented, with the following letter :

HILLSBOROUGH BRIDGE, January 28, 1884.

I. A. WATSON, M. D., Concord :

Dear Doctor : I herewith enclose you a new diagram of locality of well and surroundings where there were six cases of typhoid fever last fall. I have had one more case in house No. 2 since I wrote you in November last, making in all six known cases, and one probably from same source, as the family moved out of house No. 1 late last summer or early in the fall. This diagram is from actual measurements, and is substantially correct. I have endeavored to make it on a scale of one eighth inch to the foot, but not being used to the business it is not exact.

Yours respectfully,

M. H. FELT.

The above letters, with the comprehensive sketch which accompanies them, cannot be otherwise than conclusive as regards the relation of this polluted well to the cases of typhoid fever mentioned. All the facts are concisely given, and the evidence is so strong that no exception can be taken to the conclusions arrived at. Practically just such conditions doubtless exist in every town in the state, and the relations they bear to sickness would probably be quite as marked if as carefully investigated as in this case.

To the non-professional reader it may be necessary to explain a few points in the analysis given. Ordinarily, good drinking-water should not contain more than from three to ten grains of solids to the gallon, but in this instance there were over forty-eight. By ignition of residue is meant the burning of all the matters left after the evaporation of a given amount of water. The blackening which results from this ignition shows the presence of organic impurities ; otherwise the ash left after this combustion would be of a gray or white color, and not black. One of the strongest proofs of contamination is the quantity of chlorine found by analysis. Good water, or water uncontaminated, should not, in this locality, contain much more than one grain of chlorine to the gallon. It should be understood that chlorine, as found in water, comes from common salt (chloride of sodium), and this does not exist to any extent in the soil of this state, so that whatever amount is found in the water in excess of the quantity just stated comes from some source

Nitric acid,	.	.	.	.	.	.	.	.	.	None.
Nitrous acid,	.	.	.	.	.	.	.	.	.	None.
Copper and lead,	.	.	.	.	.	.	.	.	.	None.
Iron,	.	.	.	.	.	.	.	.	.	Trace.

EXPLANATION AND OPINION.

When the jug was opened, the odor of sealing-wax obscured the odor of the water, if it had any; after the water was emptied into another vessel no odor was perceptible. If there is any color it inclines to a greenish cast, and appears to be due to microscopic greenish mineral particles held in suspension. If water is colored from organic matter it is brownish. The total solids are wonderfully small for water drawn from so deep a well. As the residue does not blacken on ignition, it shows there is no appreciable amount of organic matter present. The volatile matter is very small, mostly volatile mineral matter. It is very soft water, remarkable for so deep a well. Because the alkalinity is lower than the hardness shows the absence of alkali carbonates. If they were present, it might point to animal contamination.

The amount of chlorine is small. It shows there is no pollution from animal sources or drains. The very small amount of free ammonia declares the absence of decaying organic matter, while the small quantity of albuminoid ammonia proves there is only a trace of living organic matter present. The absence of nitrates and nitrites indicates the absence of pollution. There are no metals to harm the water. Under the microscope, mineral particles and a few forms of vegetable life appear, but no indications of animals. All the vegetable forms are such as occur in pure water.

Every indication points to the purity of the water, and it is without question better than the average well water. I pronounce it very good water.

EDMUND R. ANGELL.

Derry, N. H., November 6, 1883.

The small amount of solids and the mere trace of chlorine in the above analysis should be noted; also the slight trace of free ammonia and albuminoid ammonia as compared with the Hillsborough water.

The following analysis was made at the request of Dr. W. H. Dinsmore, of Milford. The suspicions which led to the analysis of this water are well given in a letter which follows the analysis.

SANITARY ANALYSIS OF WELL WATER FROM MILFORD.

Odor, ...	Sour or musty.
Color, ...	Slight brownish tint.
Total solids, grains per gallon, ...	86.5
Soluble solids, " "	80.6
Hardness, equivalent to grains of CaCO_3 , ...	2.7
Alkalinity, " " "	7.5
Chlorine, grains per gallon, ...	23.1
Ammonia, parts per million:	
Free ammonia, ...	0.002
Albuminoid ammonia, ...	0.093
Nitric acid, ...	A little.
Nitrous acid, ...	None.
Iron, ...	Trace.
Lead, per gallon, ...	About 7 grains.

EXPLANATION AND OPINION.

The chlorine and lead compounds constitute most of the soluble solids, which are very great. The water is rather soft, and for this reason acts more readily on lead. The excess of alkalinity in this case is doubtless due to the hydro-carbonate of lead present. The quantity of chlorine is extremely large, and unless there is a salt mine in the neighborhood is proof of pollution from animal matter. I infer that the source of pollution is of long standing; probably the soil about the well for a long time has been receiving salt from the sink-drain, privy, stable, or a like source of contamination, and it is readily washed into the well. If a recent source of pollution gave so much chlorine, more ammonia would be likely to occur.

Good water should not contain more than one tenth of a grain of lead per gallon. This water contains about seven grains per gallon. When the analysis was made, it contained in solution 4.3 grains of metallic lead. Part of the lead had already precipitated as carbonate or hydro-carbonate. About one quarter, as nearly as I could guess, of this precipitate was taken, and found to contain 0.6612 grain of metallic lead. The accompanying pellet was extracted from this, and weighs 0.1617 grain.

The softness of the water, the large amount of chlorides, the organic matter, and the nitrates favor the solution of lead.

This water should not be used for drinking purposes under any consideration. Either source of pollution, the organic matter or the lead, condemns it absolutely. The well should be filled up.

EDMUND R. ANGELL.

Derry, N. H., November 23, 1883.

MILFORD, January 21, 1884.

DR. IRVING A. WATSON:

Your copy of the analysis of that water was received a long time ago, and I should have replied at once but for the fact that the one of whom I



wanted to obtain my information had moved out of town, and I have just found out what I desired to know.

The house was built in 1876, and well dug then. A family moved into it, and in about six months one child died with what was called diphtheria. An older one was very sick, but recovered. About a year after, the same child that was sick before was taken again, and finally died. This time all the family of seven were more or less affected.

That family lived in the house two years. It stood empty then about a year, and then another family moved in. They had been there about nine months before anything was noticed; then they were all affected with sore mouth and throat, with a diarrhoea. All recovered. Then there is a period that I cannot seem to find out anything about.

This family of whom I told you had lived there about nine months when the father was taken with what seemed at first to be diphtheria, but which turned out to be some form of blood-poisoning. Ulcers appeared on the mucous membrane of mouth, tonsils, and, in fact, as far down as you could see. Pieces would slough off as large as a cent piece. A good deal of diarrhoea. I concluded it must be the water, and prohibited the use of it, when, under appropriate treatment, the patient improved.

I sent the sample for analysis, with the result you have seen.

They only use the water now for washing.

The above is a sort of sketch of the locality, which is a pine swamp. There are houses all along North street, which is considerably higher than Dearborn street. Water stands in pools all about the well, which is only ten feet deep. The water comes sixteen rods through a lead pipe.

Please excuse such delay in sending you the information.

Yours truly,

W. H. DINSMORE.

This water contained such an excessive amount of organic matter that an inquiry was sent to Dr. Dinsmore asking more particularly about the source of contamination, whether it came from buildings upon both Dearborn and North streets or not. His reply shows that all the pollution which came from household waste must have come from the buildings on North street, and was carried a distance of thirty-two rods at least before reaching the well. The large amount of lead found by this analysis is very remarkable. It is not probable that the water at all times contained such a quantity per gallon, for if it had all the inmates of the house supplied from this well would undoubtedly have died from lead-poisoning in a very short time. It is quite probable that the sample sent for analysis was pumped early in the morning and had remained in the pipe over night. Unless the practice of pumping out the water that had remained stagnant in the pipe for any given time was regularly

resorted to, it is hardly conceivable how this family could have escaped the more serious symptoms of lead-poisoning. The entire case with the illustration given is a very remarkable one, and ought to convey a forcible lesson to every one reading it. It shows two very important facts: First, that a well may be polluted from a much farther distance than is generally supposed; second, the danger of drawing certain waters through lead pipe. In this instance both facts are so obvious that no comment is necessary.

The following letter gives some additional points regarding the drainage of the locality:

MILFORD, N. H., February 6, 1884.

DR. IRVING A. WATSON:

Your letter received, and I will try and make plain what I can of the points in question. The drainage from the houses on Dearborn street does not run toward the well. They are just on the edge of a ridge which slopes very quickly backward, so that no drainage could get into the well from them. It all goes behind them into another swale or swamp. Undoubtedly it was from the buildings on North street, if from any. There are as many as six or seven houses on North street above those shown in the sketch, and from them the land slopes downward toward the well and swamp. The swamp extends about one eighth of a mile above where the well is.

The drain is about three rods from the well, but the land is nearly on a level till the well is almost reached, when, as you will see, it rises, so that the top of the well is higher than the drain; but every rain-storm the water stands all over that low, level, flat piece of land between the well and the hill towards North street. The drain takes the water from the swamp, and all the surface water from North street, which runs into that low spot. In wet weather the level of the water in the well and that in the drain is the same. The drain is simply a ditch, which is no drain at all, but filled up in half a dozen places.

The drain is all covered up now, and frozen over with snow and ice, and I could not tell exactly.

Yours, etc.,

W. H. DINSMORE.

ANTRIM, N. H., November 1, 1883.

DR. I. A. WATSON:

Dear Doctor:—I have attended quite a number of cases of typhoid fever in Bennington this fall, and have some reason to believe that the common water may be the cause. It does not stand the nitrate silver test, but I don't care to say that the water is unfit for use on so uncertain a

ter or drains. The chlorine is considerable. Much more may be found, and yet the water be good; but when combined with other unfavorable conditions, shows contamination. The ammonia is sufficient to condemn the water absolutely. The amount of soluble solids, the blackening of the residue, the combustible matter, the excess of alkalinity, the amount of chlorine, and the quantity of ammonia declare against the purity of the water. The excess of alkalinity and the chlorine indicate pollution from animal sources or cesspools.

The microscope shows the presence of both animal and vegetable life common to bad water.

This water is unfit to drink.

EDMUND R. ANGELL.

Derry, N. H., November 15, 1883.

The above certainly shows this water to be unfit for domestic purposes. It will be seen, by referring to the report on typhoid fever in Bennington, that there were a large number of cases in that locality. The opinion is also incidentally expressed in Dr. Anthoine's letter that this had something to do with the typhoid fever which existed there. How many families having typhoid fever used this water, the writer is not able to say. Information has been received which shows that this contamination was from the street or surface drainage into the reservoir from which the water was taken. Upon receiving this analysis, the secretary immediately notified the selectmen of that town, as the local board of health, of the dangerous character of the water. They immediately posted notices to that effect, but how strictly such notices were heeded we are unable to state. The condition of the water illustrates the danger of a little surface drainage, which it is probable was not noticed or thought of by the people at the time.

LEAD POISONING.

Dr. George F. Munsey, of Greenville, suspecting that a patient of his was being poisoned by lead contained in drinking-water, requested the examination of a sample of the suspected water, and the result showed that his suspicions were correct, as will be seen by the following analysis:

ANALYSIS OF WATER FROM TEMPLE.

Odor, ...	Not very perceptible.
Color, ...	Slight brownish tint.
Total solids, grains per gallon, ...	1.9
Ignition of residue, ...	It blackens some.
Volatile and combustible matter, ...	0.7
Hardness, ...	1.4
Alkalinity, ...	0.75
Chlorine, grains per gallon, ...	0.2
Ammonia, parts per million,—	
Free ammonia, ...	0.0866
Albuminoid ammonia, ...	0.0850
Nitric acid, ...	None.
Nitrous acid, ...	None.
Iron, ...	None.
Lead, grains per gallon, ...	0.069

The microscope shows much vegetable growth. Some of it is decaying, giving rise to bacteria and fungi.

EXPLANATION AND OPINION.

The water was filtered before analysis; otherwise the total solids, the blackening of the residue, the combustible matter, and the albuminoid ammonia would give larger figures. Organic matter in solution passes through the filter, and so filtering, together with other work, gives some idea of the ratio of decay and life. There is a large amount of vegetation present, too much altogether, because the more life there is, the more decay there must be sometime, and considerable is occurring now, although most of the vegetation is in a state of growth. The vegetation is of a brownish color; hence the tint of the water. The water is very soft; consequently it acts freely upon lead. Water should not contain more than one tenth of a grain of lead per gallon. This water does not contain quite so much, but approaches it, needing only .031 of a grain more to make .1. This is a very suspicious water, both from the presence of lead and of vegetation.

EDMUND R. ANGELL.

Derry, N. H., February 7, 1884.

In answer to some inquiries sent him regarding the case, the following letter was received, which sufficiently explains the matter. It also illustrates how small a quantity of lead may produce serious results if its use is followed for any considerable length of time :

GREENVILLE, N. H., April 21, 1884.

DR. WATSON:

Dear Sir: Of the four persons using the water, only one was affected, and she, a woman of forty years of age, has had a very serious time of it, being under my care for the past four months, and even now, though much improved, is still unable to use her hands to any great extent. She has had all the symptoms of chronic lead poisoning; in fact, a typical case. My opinion is, that the other three, being away from home more or less as they were, escaped being poisoned, while she, the patient, was at home all of the time for more than a year previous to her sickness, drinking nothing but water from the same source as the sample sent you.

Yours truly,

GEO. F. MUNSEY.

The following analyses are quite interesting when taken in connection with the letter and sketch which accompany them. It will be seen by referring to the sketch, that well No. 1 is situated in close proximity to bad sanitary surroundings, but not more so than are many hundreds of wells throughout the state, yet the analysis shows it to be very badly polluted with sewage; in fact, it is itself a cesspool of dilute sewage. The excessive amount of chlorine (19.6 grains per gallon) shows that it has received the household drainage to a very large extent.

The analysis of the water from well No. 2 is interesting when taken in connection with the history of the case to which the letter refers, because of the lead it contained. The explanation given by Dr. Hatch, that the lead came from the stagnant water in the pipe between A and B, is doubtless the correct solution of the case. It is more than probable that had the water been constantly running at the house the same as at the new stable, no cases of lead poisoning would have occurred. This is a very important lesson for those who connect their water pipes in this manner.

SANITARY ANALYSIS OF WATER.

No. 1, Old Well.

Odor, ...	Slightly musty.
Color, ...	Very slight brownish tint.
Total solids, grains per gallon, ...	47.4
Ignition of residue, ...	It blackens some.
Volatile and combustible matter, ...	7.8

Hardness, equivalent to grains of CaCO_3 , ...	8.6
Alkalinity, " " "	3.0
Chlorine, grains per gallon, ...	19.6
Ammonia, parts per million,—	
Free ammonia, ...	0.032
Albuminoid ammonia, ...	0.116
Nitric acid, ...	Considerable.
Nitrous acid, ...	None.
Iron, ...	Merest trace.
Lead, ...	None.

MICROSCOPIC EXAMINATION.

Some vegetation; of animal life, infusoria, order ciliata; also cyclops quadricornis of the order copepoda, sub-kingdom annulosa.

EXPLANATION AND OPINION.

The amount of solid matter is large. Of this, salt comprises 32.15+ grains, corresponding to 19.6 grains of chlorine. Water naturally contains say from 0.4 to 1.5 grain per gallon. The excess of salt comes from sewage and animal filth, and shows that this water is badly polluted. The amount of ammonia is a little too large. The nitric acid points to animal products. The presence of the animal life indicates organic matter in solution.

This water is unfit for drinking purposes.

No. 2, New Well.

Odor,	.	.	.	.	.	.	Slight.
Color,	.	.	.	.	.	.	Slightly yellowish.
Total solids, grains per gallon,	.	.	.	.	.	.	1.5
Ignition of residue,	.	.	.	.	.	.	It darkens very slightly.
Volatile and combustible matter,	.	.	.	.	.	.	0.5
Hardness, equivalent to grains of CaCO ₃ ,	.	.	.	.	.	.	0.8
Alkalinity,	"	"	"	"	"	"	0.5
Chlorine, grains per gallon,	.	.	.	.	.	.	0.1
Ammonia, parts per million,—							
Free ammonia,	.	.	.	.	.	.	0.07
Albuminoid ammonia,	.	.	.	.	.	.	0.10
Nitric acid,	.	.	.	.	.	.	None.
Nitrous acid,	.	.	.	.	.	.	None.
Iron,	.	.	.	.	.	.	Very slight trace.
Lead, grains per gallon,	.	.	.	.	.	.	0.07

MICROSCOPIC EXAMINATION.

Some vegetation and a few infusoria, order ciliata.

EXPLANATION AND OPINION.

This water is remarkably free from minerals. It is polluted to some extent with vegetable matter, perhaps not to a dangerous extent.*

"The presence of ciliata indicates organic matter in solution to some relative extent not yet precisely determinable."

It is so soft that it acts very readily upon lead. Good water should contain less than 0.1 grain per gallon. The sample of water contains the most of that amount. Water standing for a few hours in the pipe might contain several grains of the metal. I think that the patient is poisoned from this source.

The well should be thoroughly cleaned out and the pipe removed.

EDMUND R. ANGELL.

Derry, N. H., March 31, 1884.

WILTON, N. H., April 18, 1884.

PROF. E. R. ANGELL:

Dear Sir: As regards the stomach affections of persons using water from the wells of W. P. H., I will state the following: First, of Mr. H. himself. His trouble began some time about three and a half years ago. His stomach began to trouble him after eating, distress at times, and later, severe colic. Always when he had a colic he had a severe pain in the epigastrium, and within a year pressure at that region would cause vomiting. He has had wrist-drop and paralysis of the exterior muscles of fingers for a year and a half, or perhaps a little more, but *not* before he used water from new well, which well was dry about two years ago. The last attack of colic I attended him, about six months ago;—very severe, great pain in epigastrium, and pressure there caused vomiting; had to take all medicine and nourishment per rectum for several days.

About the other. One laborer, P. P., worked there about four years ago, and more or less for three years following; had several attacks of pain after eating, very severe, and other minor attacks.

One other, B——n, has worked there for three and a half years; has had similar attacks for a part of the whole period.

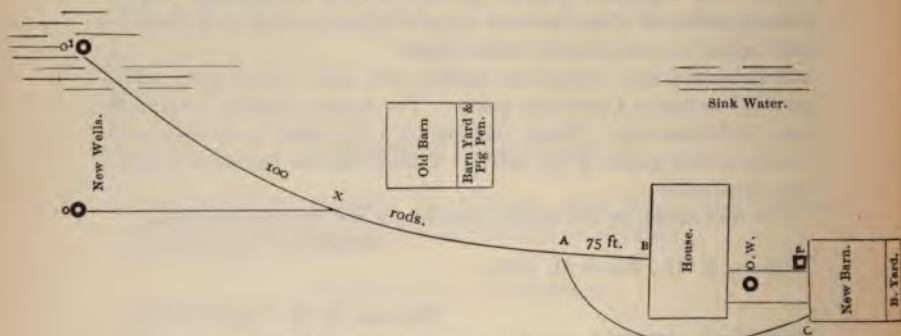
There were a man and his wife there last summer; both complained of same feelings. One other, J. P. H., has not had much trouble. Mrs. H. has had no trouble, but very severe headaches, which she has quite often. She has lived there about two or two and a half years.

Now I will append a rough sketch of the wells and surroundings, and I

*I think it is suspicious water on account of organic matter.

think it will make it plain where he gets the lead. He (Mr. H.) drinks a great deal of water, and would be apt to get some as early in the morning as any of them.

The old well is underneath the L, about forty feet from privy, sixty feet from sink water, one hundred feet from old barn, where stock is kept to some extent, also pigs, and which slopes towards old well;



A rough sketch of wells and buildings of Wm. P. Holt, of Wilton, N. H.

new barn cellar is eighty feet from old well and on lower land, and slopes away from well. The new wells are in a pasture about one hundred rods from house, on higher land than house or old barn. One of them, O¹, is in marshy land, and at times it overflows; still he says there is a good lively spring. This pasture has been used to keep pigs and hogs in, and nothing there to keep them away from well.

One other feature, and what I consider explains the lead poison, is, that the water runs all of the time from both new wells, which connect at X on to A, and then to C, and the new barn water runs the whole distance all of the time; but from A to B, a distance of seventy-five feet, it only runs as they use it; it is stagnant there all night. Mr. H. says that he always lets it run a while before drinking in the morning, but probably not enough.

This, my report, I submit to you, and through you to the State Board of Health. There is no expense, and if you want to know more I will gladly answer all questions.

Yours resp.,

G. W. HATCH, M. D.

The following analysis is of water taken from the well of Dr. Merrill, of Plymouth, and illustrates how a well may become polluted from unexpected sources. The well in question is fifteen feet deep, covered with a flat rock, and the bottom of

it is twenty-five or thirty feet higher than Dr. Merrill's house, and is twenty rods distant from the same. The water is drawn through a tin-lined lead pipe. About ten rods from this well, at an elevation of ten feet, is a stable, the natural drainage of which is towards this well. The analysis shows the pollution from drainage to a very great extent, as evidenced by the large amount of volatile and combustible matter, as well as the excessive amount of chlorine. The drainage, which contaminated this well so as to render it unsuitable for domestic purposes, must have percolated through about ten rods of soil to have reached it. The lesson to be drawn from this case is obvious.

ANALYSIS.

Odor, ...	Not perceptible.
Color, ...	Clear.
Total solids, grains per gallon, ...	21.3
Ignition of residue, ...	It darkens but slightly.
Volatile and combustible matter, ...	3.1
Hardness, equivalent to grains of CaCO_3 , ...	7.6
Alkalinity, " " " "	1.0
Chlorine, grains per gallon, ...	5.8
Ammonia, parts per million,—	
Free ammonia, ...	0.008
Albuminoid ammonia, ...	0.062
Nitric acid, ...	Considerable.
Nitrous acid, ...	None.
Iron, ...	Mere trace.
Lead, ...	None.

MICROSCOPIC EXAMINATION.

Chief appearance, fungi that produce numerous sporules; animal forms, infusoria, order ciliata and keronia.

EXPLANATION AND OPINION.

There is but little organic matter as such in the water at present, as the slight blackening of the residue and the small amount of ammonia show; but the chlorine and nitric acid declare that animal filth has found its way into the well sometime, though not recently to much extent, at least, for we should then find more ammonia and more blackening of the residue.

"The notable presence of the ciliata would indicate not only stagnant water, but such as may contain organic matter in solution to some relative extent not yet precisely determinable."

It would seem that during the winter pollution has been shut out, and that what we find now is the ultimate decomposition of filth that entered before the ground froze, so that the water now shows its very best for the whole year. I think it will be very bad water during warm weather.

EDMUND R. ANGELL.

Derry, N. H., March 31, 1884.

THE LITTLE BOAR'S HEAD WELL,

which has attracted considerable attention the present season, and been the source of many false newspaper reports, is most remarkable in the history of water pollution. Briefly, the history connected therewith is as follows:

A wealthy Philadelphian by the name of Lewis, who has spent his summers at this noted resort for the last twelve years, bought last spring a lot of land, and built a very expensive and elegant summer residence. The location was upon an elevation some forty or fifty feet higher than the sea, and but a short distance from the water. This elevation is made up mostly of seamy ledges, with but a few feet of soil covering the same. From a sanitary point of view, no better site could possibly be selected.

Instead of building a sewer to the ocean for drainage purposes, he constructed a cesspool forty feet distant from the house, into which all the sewage from the house ran. In building this cesspool it was necessary to excavate three feet of the ledge to get a good and sufficient depth. Sixty feet from this cesspool, and apparently upon the same level, was dug the well which was to supply this residence with water. After reaching the ledge, it was necessary to go ten feet into the rock to get sufficient water, which was obtained in abundance, and was excellent in quality. The well and cesspool were both constructed at the same time, and in *two weeks after, the well was polluted by this cesspool*. The family, not realizing the source of pollution or its danger, continued to use the water for a short time afterwards, or until it became so tainted that it was repulsive to the sense of taste and smell. The result was the death of Mr. Lewis, and a lady visitor who lived in the vicinity and frequently drank of this water, and a severe illness of a daughter of Mr. Lewis, his servant, and a guest of the family.

These seemed to be cases of blood poisoning, the severer ones resembling in their last stage typhoid fever.

This instance of well pollution illustrates the fact that a rock formation, though generally believed to be the best safeguard against the contamination of a well, may be the most dangerous. The seams which existed in this ledge no doubt served as direct channels to convey the filth to this well.

It will be seen from the above that great danger results from the use of impure water, and that it is often found to be of a very dangerous character where least expected. It cannot be otherwise that wells from their very nature often become polluted, and in many instances taste, smell, or color does not disclose the fact. This should lead all who are dependent upon wells for a water supply to carefully consider this important subject.

With pure water, pure air, healthful food, and general cleanliness in the family, there would be much less sickness, longer lives, fewer funerals among the young and middle aged, and much more happiness.

THE AMERICAN PUBLIC HEALTH ASSOCIATION.*

The annual meeting of this association is now looked upon as one of the leading events in the work and history of sanitation in this country. The growth of this association from the small nucleus formed in one of the parlors at the Ocean Hotel at Long Branch in 1872, eleven years ago, to the strongest and most influential organization of its kind in the world, embracing as it does more than seven hundred representative men from all professions and many of the commercial walks of life, is an evidence of sanitary progress that has no parallel. To the popular mind, which often fails to comprehend why or how the physician can and does, through gratuitous advice and often vehement protestation, reduce the sickness of a community, and thereby limit the thickness of his incapacious pocket-book, it may seem inexplicable, when it is stated that of the list of members over five

* Report of the secretary as delegate from the State Board of Health.

hundred are physicians, very many of whom occupy the highest professional positions in the army, the navy, and in civil life. It should be remembered that this association is a voluntary one, its members working for the common purpose of lessening the ills and the sufferings of humanity through the many avenues open to reach the people. Each member present has left his field of labor, paid his own expenses, and given his time to forward the most humane work that is within the province of human energies and privileges. The public is to be assured that this great work has its compensations. It is not a labor of self-sacrifice, even though it may be financially unprofitable to the individual. There are equivalents that are preferable to a hybrid bird stamped upon a circular piece of silver. The consideration of doing good in such a magnanimous work is not a small compensation. The meeting and associating with cultured and able co-workers; the listening to able papers upon many topics intimately connected with the daily life of every family and community; the interesting discussions that follow these papers, bringing out the views and practical observations of those who have no time to write upon the subjects under consideration; the large and elegant volume which is annually published, containing the papers and discussions,—all these and much more may be entered upon the credit side of the account. Thus, while the members of this body give their time, their energies, and their money to the work, it is not without its rewards.

The eleventh session of this association was well attended by representative men from all sections of the country, and the character of the papers presented was of a very high order. The spirited and able discussions that followed the reading of the papers was not the least instructive and interesting part of the programme.

ADDRESSES OF WELCOME.

The deliberations of this body were presided over by Dr. E. M. Hunt, of New Jersey, its able and honored president. In his address he reviewed the growth of this association and the general progress of sanitary work throughout the world, specifying some of the most important discoveries of the day, and indulging in a hope for the future more brilliant even than the

past. In discussing the subject of national protection against disease, and the penurious and somewhat indifferent action of congress upon the subject, he says,—

As an American citizen, I feel far more humiliation from the sentiments of the congressional committee and the debate in the house of representatives, than from any temporary check given to national health administration.

America, with its grand progress in all material interests, has done so little to foster inquiry into the pervading evils which decimate and deteriorate population, that I was not prepared for responses to sentiments which involved the discouragement of all scientific inquiry into the causes of disease, and which not only crippled the hands but impugned the motives of some of the noblest men who have given unselfish attention to this great interest.

Money enough to chase a pestilence, but not a cent to investigate its cause or deal with disease all over the land, is like washing hearses, buying coffins, and hiring grave-diggers and mourners for the victims of small-pox, while Jenner is refused a pittance in order to prevent it. Be ready with sappers and miners, with lint for bandages, for the first report of an explosion in a coal mine; but close Sir Humphry Davy's laboratory, and proclaim his safety-lamp a wire screen for the amusement of the experimenters. This is not the plan of France and Germany, for Pasteur and Koch have carried the war into Africa, and are studying causes alongside of the pyramids.

Yet, notwithstanding all this, we have no need to become discouraged. There are cities in the United States to-day where health administration, in spite of all embarrassments, has achieved results notable and grand, and over which health officers preside whose names and opinions are a power at home, whose presence here is an inspiration and assurance of success. There are township and village officers who are educating the people, and giving tone to the popular sentiment. There are state boards, whose beneficent influence is felt in their own state and throughout the land. There is a public press, whose utterances in this behalf have been able and thoroughly encouraging.

There will be occasional reverses and disappointments: for such a cause there is no law of strength without them. Pestilence itself becomes a sanitary measure. All these zig-zag courses will not make a man give up his ship. Nowadays we have enough old, experienced pilots to know whither we are sailing. We are progressive and aggressive because right, because backed by a science and an art able to certify themselves, and because there are means both of technical and popular enlightenment, which voice and pen, book and press, will not fail to use. But we should

have great patience. It has truly been said that "the rapid progress of sanitary and preventive medicine during the last twenty-five years has not been from dawn, but almost from absolute darkness into daylight."

The address of John Avery, M. D., president of the Michigan State Board of Health, was an able and interesting one. In complimenting the work of this association, and reviewing the results of sanitary progress of the past and present, he says,—

No one phase of the great advance in medical science during the last century so well marks its progress as this association, composed of its most eminent leaders and teachers, and organized for the purpose of teaching the people how to prevent disease, rather than for the discovery of the best means to cure it. When the members of a noble profession, whose fees proverbially increase with the ignorance, vice, and misfortunes of their fellow-men, unite with eminent scientists and humanitarians of the laity to teach communities and individuals that sickness is preventable waste, and that health is money, and like it may be had by diligent seeking, who shall say that civilization has turned backward, or that the profession of medicine is wholly a money-getting one? It has been well said that "He who cures disease may be the skilfullest, but he that prevents is the safest, physician," and, we may add, is justly entitled to the larger fee.

Millions for defence, not a cent for war, would be a far safer maxim for communities and nations in sanitary science than in military; yet we practically reverse it, and pay millions to drive the invader out, where a few thousands would have prevented his getting a foothold.

A people that would quietly look on and see a dangerous enemy preparing to invade their country, despoil their homes, and to murder alike old and young, women and children, and make no preparation to repel the invaders and to protect themselves against robbery and murder, would be regarded as unworthy a place among nations. Still more, should they quietly watch the gathering mob of rioters in their midst, intent on pillage and murder, listen to their mutterings of vengeance, and calmly await the slaughter to commence, without an attempt to protect their homes and little ones, would they be regarded as unworthy of homes and children.

More terrible and deadly, and more destructive to business prosperity than an invading army, are Asiatic cholera and yellow fever. More relentless and cruel, and more destructive to little children than mad rioters, are those twin scourges, scarlet fever and diphtheria. When nations, communities, and individuals shall learn that these and kindred diseases are enemies to society, to be repelled or summarily dealt with upon their first appearance, then will they begin to appreciate the earnest and faith-

ful work of this association, and to realize that true economy, in dealing with disease, as with a foreign or domestic enemy, is a liberal expenditure for defence. That a more general public interest in the comparatively new science of sanitation has been recently awakened in this country is due very largely to the efforts of the members of this association and their co-workers.

The association was welcomed to the state of Michigan by a brief address by His Excellency Josiah W. Begole, governor of Michigan. In referring to the spectacle of so many distinguished men, especially from the medical profession, taking part in a united effort to prevent disease, he paid that profession a high compliment. He regarded the subject of health as occupying an important place in the science of political economy. He asserted that disease, "in a large class, means not only pain, bereavement, orphanage, and widowhood, but also poverty and pauperism;" and that the spread of infectious and contagious diseases tends towards financial ruin in the commercial world. He believed that this great work must be prosecuted through boards of health, and that "the spread of contagious diseases and epidemics cannot ordinarily be prevented by private or individual effort. Boards of health, invested by law with summary powers, are the only effectual means for accomplishing this end." In speaking of the work in his own state, he said he could "point with pride to our State Board of Health, which, by its valuable suggestions and assistance, has enabled the local boards to accomplish much good in removing the causes of disease and preventing its spread." Contrasting the sanitary work of the medical with the practices of the legal profession, he said,—

If before the end of my official term I can have the pleasure of welcoming to the state a convention as truly representative as this, composed largely of men learned in law, and met to devise means by which litigation may be avoided, and to impart to the public such information as will do away so far as possible with the necessity of employing counsel, I shall feel like saying, with Simeon of old, "Lord, now lettest thou thy servant depart in peace * * * for mine eyes have seen thy salvation."

In closing he bid the association welcome to the state of Michigan and the beautiful city of Detroit, and trusted that the work for which they had assembled would result in unnumbered blessings to the communities and the states which were represented.

DISEASES OF DOMESTIC ANIMALS.

The first series of papers presented was on the diseases of domestic animals. It may here be remarked, that the papers presented at this meeting were thoroughly classified, so that those upon kindred subjects were read and discussed in a group rather than individually, thus considering and disposing of one topic before another was taken up.

The first paper read was by Dr. D. E. Salmon, Veterinarian of the Department of Agriculture, Washington, D. C., upon Texas Cattle Fever. Is it a chimera, or a reality? This paper recounted at length many of the epidemics that have occurred among cattle in this country since the latter part of the last century. Of the Texas cattle fever, so called, he goes back to 1853, when the first reports of diseased cattle being driven from Texas into Missouri, Kansas, and Iowa were brought to notice. He passed briefly over some of the earlier epidemics, but spoke particularly of the one in 1868, when diseased cattle from Texas died in large numbers even in the stock-yards at Chicago. This epidemic was investigated by the Department of Agriculture and the Chicago Board of Health, and it was proven so conclusively that this disease came from Texas, that since that time comparatively few have been transported directly from Texas to the North, though he said there is never a year but that some such cases occur.

He criticised very ably the attempt of some writers in the Southwest to prove that this disease was innocuous, and that it did not belong specifically to Texas cattle. This idea was successfully controverted by him, and the position taken was subsequently corroborated by the remarks of Dr. Hillary Ryan, of Texas, when the subject was under discussion. In closing his paper he said,—“Allow me to express the belief that it is too late to decide that Texas fever is a chimera; too late to try to explain away the terrible losses that have been traced only too certainly to the cattle from Southern ranges; too late to try to convince the Northern stock-owner that sanitary regulations are not demanded for these animals; too late to try to wipe out the accumulated experience of a century. The hundreds who have lost their all through ignorance of the existence and characters of this plague, the thousands of square miles of territory that are

ravaged almost annually, are enduring evidences of the reality of Texas fever."

The second paper was by Joseph R. Smith, M. D., brevet-colonel and surgeon, U. S. A., of San Antonio, Texas, and was entitled "Observation on Texas Cattle: Age, Weight, Temperature, Liver, and Spleen." This paper was a continuation of the investigations which Dr. Smith has been making for several years past, previous papers having been published in the former Transactions of the Association. The paper was largely a statistical one, giving the *post-mortem* results in a large number of cases among cattle, and shows that Dr. Smith has given a great deal of time and attention to this important subject. The paper is a valuable one for reference. The next paper of this series was in the form of a letter from Dr. William T. Belfield to Oscar C. DeWolfe, M. D., commissioner of health at Chicago, and describes the disease in cattle popularly termed "Swell-Head." This was a very valuable and interesting paper, inasmuch as it describes the pathology of the disease, which hitherto has not been well understood. It has long been known that cattle have been afflicted with swellings or tumors upon the head and face which slowly develop until they destroy the animal. These growths were supposed to be cancerous or tuberculous. A few years ago Bollinger, royal professor of veterinary medicine at Munich, found in them large numbers of a microscopic plant which penetrated the entire mass, even the bones not escaping. Subsequently numerous other investigators corroborated this discovery, and experiments were made by introducing this plant into the healthy tissues of an animal, which resulted in the formation of this tumor. The word "actinomyces" has been given this plant. It belongs to the same family as the molds which grow upon moist bread. Other varieties of the same family have been known, heretofore, as the cause of diseases like the mange in dogs and the ring-worm in children. This disease is not confined exclusively to cattle. On this point Dr. Belfield says,—

Within the past four years it has been discovered that this disease attacks not only cattle and hogs, but also the human species. More than thirty cases of actinomycosis in human beings have already been reported by German observers.

In man the disease presents a different aspect from that observed in cattle. In many cases it begins as a swelling of the jaw, and it has been demonstrated that in the human animal, at least, the parasite gains entrance to the body through the cavities of carious teeth. In other cases the tumor appears, not upon the face, but upon the hand or arm: in fact, a scratch anywhere upon an exposed surface of the body seems a possible beginning for the disease in those who are compelled to handle cattle or grain.

In man the disease does not remain localized, as is often the case in cattle, but rapidly spreads to the internal organs of the chest and abdomen. In many cases the spinal column also is invaded by the parasites. Hence the symptoms presented by the patient vary extremely, and often simulate those of other diseases. In nearly all cases thus far reported the affection has been supposed to be blood poisoning, pyæmia, pleurisy, inflammation of the bowels, Potts's disease of the spine, etc., the true nature of the complaint having been recognized only by a post-mortem examination. Hence it is highly probable that the disease frequently attacks human beings resident in infected districts, but is not recognized, and is called by some other name. Human beings seem to afford a more favorable soil than cattle for the growth of the plant, since in man the disease is invariably fatal. It is, of course, possible that if the nature of the complaint be recognized, and treatment promptly adopted, the disease might be just as curable in man as in cattle.

This letter may be found in full in the 12th vol. N. H. Agricultural Report, just published.

MALARIA.

Several very able papers were presented upon the subject of Malaria. It was a very remarkable coincidence that three very able army surgeons should have written upon this subject independently, and yet should have presented the same ideas and arrived at the same conclusions. The first paper was by Dr. George M. Sternberg, Major and Surgeon, U. S. A. The paper was an exceedingly able one, and embodied in detail the views of this close student and original investigator concerning the germ theory of malaria. He believed that the organism of this disease has not yet been discovered. He was not prepared to refute the statement that Klebs or Tommasi-Crudeli had discovered the *Bacillus malarie*. On this subject he says,—

Indeed, there are many circumstances in favor of the view that the etiology of these fevers is connected, directly or indirectly, with the pres-

ence of bacterial organisms or their germs, in the air and water of malarious localities. But that the *Bacillus malariae*, or any other parasitic micro-organism, invades the blood of those exposed to malarial emanations, and produces the characteristic paroxysms of intermittent and of other forms of malarial fever, by its presence and multiplication in the circulating fluid, is an hypothesis which rests upon a very slender amount of direct evidence, although it is now more than four years since the discovery of Klebs and Tommasi-Crudeli was announced, and malarial fevers are so widely prevalent that we are justified in looking for confirmation from numerous independent sources. But, so far as I know, no one in America has ever seen the *Bacillus malariae* in the blood of a malarial fever patient, nor has confirmation come from English, German, or French sources. On the contrary, a French physician, Lavarán, who has spent much time in the microscopical study of the blood of malarial fever patients, claims to have discovered quite a different parasite, his *Oscillaria malariae*, and makes no mention of having met with the *Bacillus malariae* of Klebs and Tommasi-Crudeli. The same remark applies to the researches of Richard, who confirms Lavarán.

For my own part, I must confess that I have never seen, in the somewhat numerous specimens of blood which I have examined from malarial fever patients, either the *Bacillus* of Klebs and Tommasi-Crudeli, or the parasite described by Lavarán.

He did not regard the finding of micro-organisms obtained from post-mortem examinations, especially in warm climates, any evidence that such germs were present during the earlier stages of the disease. On the other hand, he presented much evidence of a negative character. The asserted discovery of the germ of malaria was mostly from cases of pernicious fevers at the Roman Campagna and other parts of Italy, which the writer believed to differ very essentially from the ordinary intermittents and remittents of this country. Notwithstanding the discovery of the malarial germ is not proven, he believed that we were much nearer a solution of the question, What is malaria? than ever before, and that the thorough study and investigations of many independent workers in this field could not fail eventually to discover the cause of this disease. That malaria is of telluric origin there is no question: of the exact conditions necessary to develop it, there are yet some differences of opinion. The author believed that there are other factors than those embodied in the marsh theory of the disease, which perhaps may explain why, in two sections of the country precisely alike topo

graphically, the disease exists in one and is not found in the other. In closing his paper he says,—

As there is, in all probability, another essential element in the equation, an unknown biological factor, we need not be surprised at these apparent exceptions;—and we cannot expect to fully explain all the phenomena relating to the evolution of the malarial poison until we have obtained some definite information as to the kind of vegetable decomposition upon which it depends, and the life history and conditions of development of the living ferment or ferments which are concerned in this decomposition, the physiological changes which these micro-organisms may undergo in nature's laboratory from changes in their environment, the enemies which they have to contend with in the struggle for existence, etc., etc.

The second paper was by Dr. Albert A. Woodhull, Surgeon U. S. A. This author coincided largely in his opinion with the views expressed in the paper of Dr. Sternberg. He discussed the germ theory of the disease, but doubted that the specific germ had yet been discovered. He also thought that there might be a pathological factor in the question of malaria that had not yet been fully recognized. As an illustration, he cited the fact that along the rivers of California nearly all of the whites were affected more or less with the disease, while the Chinese generally escaped; but as the latter did not drink the water except in infusions of tea, it was somewhat uncertain whether this exemption depended upon race characteristics, or upon the fact that the water was boiled. Referring to the reëappearance of malaria in New England during the last few years, especially in Connecticut and Massachusetts, he said that "In the early history of that country paroxysmal fevers abounded. They disappeared coincidentally with the establishment of better drainage and cultivation, and presumably on account thereof. They certainly have reëappeared within the last twenty years; but in a territory lying as it does, a moderate excess of heat, a slight change in the natural or artificial distribution of water, especially beneath the soil, the growth or destruction of forests, the alterations that commerce makes in the earth's surface, may readily turn the scale."

The continuance of malaria during the winter had been cited

by some as evidence against the local origin of this disease. The author quotes Dr. Smart on this phase of the disease as observed in the West, as saying, "Its occurrence with the thermometer at zero or below seemed absolutely inconsistent with a malarial origin," but "those perplexities vanished when variations in the organic impurity of the water were shown to correspond with variations in the intensity and prevalence of the disease."

The third paper was by Dr. Charles Smart, Surgeon U. S. A., who has given a great deal of attention to this subject, and especially to the relations of drinking-water to the disease. He entertained substantially the same views as were presented in the previous papers, but believed that the disease was more generally communicated through drinking-water than was supposed. He referred to the fact that the villagers of the malarious plains of the Crimea who drank marsh water had fever at all times, while those who drank pure water got ague only during the late summer and autumn months. In support of this theory he cited the well known instance of the *Argo*, which sailed from Bône for France with one hundred and twenty soldiers, of whom thirteen died on the short voyage, and ninety-eight landed at Marseilles, suffering from pernicious malarial fever, which readily yielded to quinine. Four casks for the soldiers' supply had been filled with marsh water, prior to the voyage, at Bône. The crew of the vessel, which had water from a different source, were unaffected, as were the crews of other transports which sailed at the same time. The *Argo* was the only vessel carrying marsh water.

He cited Dr. Swift, of Connecticut, as saying, in the report of the board of health of that state, that shallow wells affording only surface water were among the most prolific sources of typho-malarial fever. He related several instances of the same character coming under his own observation. Too little attention was given to the subject of pure water supplies. He said that "the English take care of their water supplies; we do not. Two months ago, while the authorities of London were endeavoring to suppress some work which caused a dust in the vicinity of the filtering-beds of one of the water companies, the city council of New Orleans was establishing a nuisance-wharf within

three blocks of the in-take of the water supply, and with an in-shore, up-stream current between the two points."

Dr. R. D. Webb, of Alabama, presented a paper showing "The Changes in Type which Malarial Fevers have undergone in Sumpter County, Alabama, from 1833 to 1883." Dr. Thomas F. Wood, of North Carolina, presented a paper entitled "The Clinical Thermometer in the Prevention of Malarial (Paludal) Fevers, especially that form of it to which seamen sailing out of South Atlantic and Gulf ports are liable." Dr. J. W. Penn, of Tennessee, presented some "Interrogatories on Malarial Fever." After the reading of these papers they were thoroughly and ably discussed by members of the Association.

PHYSICAL TRAINING.

On the second day of the meeting, two very creditable papers were read upon the subject of physical training, one by Prof. D. A. Sargent, of Cambridge, Mass., and the other by Prof. J. Madison Watson, of Elizabeth, N. J. Prof. Sargent reviewed, somewhat in detail, the history of physical exercises, from the earliest history of civilization down to the present time, and showed conclusively many of the dangers resulting from excesses of such exercises. In referring to the history of the Persians and the Greeks, he found that bodily training was a very essential part of their education. Later in their history this training assumed a gladiatorial and military character under the rule of the Roman emperors. In this respect the exercises of the Roman youth differed from that of the Greeks, so that many repaired to Greece for that special training which became necessary to the highest physical as well as mental education. Of the excesses to which these exercises were carried in Rome, he says,—

With the pugilistic encounters began the gladiatorial combats. These brutal exhibitions aroused the latent animalism of the Roman masses, and led to the most gigantic spectacles of human butchery and carnage the world has ever seen. Internal strife and reckless dissipation soon followed, exhausting the nation's vital resources, and making the brutal sports of the arena seem tame and undesirable.

The natural equipoise between the physical and the mental development was not maintained, and the latter became dimin-

ished or weakened, while the ascendancy of the former was very remarkable, becoming a large factor in the downfall of that nation. Contrasting the differences between the earlier days of our own country and the present, he says,—

In the early history of American settlements we find no necessity for physical training. Breaking up ground, clearing forests, and hunting Indians gave our forefathers all the exercise they needed, and the domestic duties of a frontier life kept our maternal ancestors free from nervous debility and muscular feebleness. With increased wealth, division of labor, and intensified mental life, came the necessity for more physical exercise.

The Greeks have taught us the danger of supreme physical development without moral stability. The Romans have shown us how easily refined sensibility can become blunted, and coarse animal instincts gain the ascendancy. The early Christians have taught us the perils of neglecting the body, mortifying the flesh, and long suppressing the natural sympathies and emotions. In the bold, dashing, and gallant knights we get the reflex influence of the accomplished arts, fencing, boxing, horsemanship, etc., which flourished in the age of chivalry. In the stolid but persistent drilling and marching of the German youth, in the feats of the Turn-Platz, requiring unity, strength, solidarity, we get the key to the same qualities which have dug down into the depths of science and literature, and placed their nation at once in the foremost rank of the military and thinking world.

He deprecated in strong terms the present tendency of our college education towards the excesses which have been mentioned. He believed that those athletic sports which have become so popular, possess a large element of danger unless an influence is brought to bear which will discourage the turning of what would otherwise be a legitimate and profitable exercise into competitive sports which in themselves require the training of an expert to accomplish. He believed that

Specializing in athletics will prove as injurious to health as specializing in business. Prolonged practice of a skilled sport is as trying to the nervous system as the practice of a skilled profession.

Raising the standard of a game limits the number that can play it, and reduces its value as an exercise and a recreation, making victory the primary object and health and development secondary considerations, opens a way for professional trickery, exacts more work than is necessary for the welfare of the body, and invites dissipation after the victory is won. Yet these are the unmistakable tendencies which threaten to impair the

usefulness of some of our popular physical exercises, making them sources of evil rather than sources of good. To prevent this tendency, and to make these powerful agents contribute their influence towards the upholding of character and the development of physique, are problems worthy the consideration of all.

Inasmuch as our college students raise thousands of dollars annually for the support of athletic organizations, and are lampooned throughout the country for the excessive interest they are supposed to take in physical exercise, it might naturally be suggested that the reform begin with them; but having stood at the door of one of our largest universities, and examined thousands of youth as to their health and physical capacity, we feel prepared to say that the reform should begin in homes and preparatory schools. Students enter college trained in mind, but not in body; and where one fails for want of mental ability, ten break down for want of physical stamina. Many are short in stature for their age, or tall and slender, with a deficiency of muscular strength. Under an appropriate system of physical training, however, they make most rapid advancement, showing that their bodies had been kept in arrears while their brains were developed. Many are ignorant of the first principles of physiology and hygiene, and leave school with acquired defects which are past remedying, but which a little appropriate knowledge and training could have obviated. Not infrequently the students who stood the highest in the preparatory schools are taken with a sort of mental dyspepsia after entering college, and devote most of their energies to physical exercises. This is invariably the case where the preparatory training has been forced and unnatural.

The physical exercises of school children, and even college students, should be governed and regulated by some one competent to judge of how much and what kind of exercise is best in each individual case. That physical exercise is as important as any other branch of training or education did not admit of controversy: it was essential, and without it the highest mental development could not be attained. Such exercises should be regulated by the well known laws of physiology and the best principles of hygiene. In determining the character and quantity of exercise best adapted to the individual, his physical structure, personal history, functional organization, and hereditary tendency should be carefully considered. Especially is this true of the youth who is in feeble health. Athletic sports and exercises determined by his own class are no criterion for him to follow; indeed, it might be his worst possible course. All

games and exercises, upon which the student's mind is wrought up to the highest point of excitement, were condemned in the strongest language.

The intense rivalry, social pressure, and popular glamour which are behind these exercises, prompt the young athlete to train more vigorously than he otherwise would, and the expectation of victory or defeat, with the accompanying excitement, keeps the subject constantly before him. If he tries to do conscientious work in his studies he makes a double draft upon his system, and is liable to break down during his training. At the same time the value of competitive sports must be recognized. They are splendid aids to discipline, and tide the young over a dangerous period. They develop patience, perseverance, courage, presence of mind, and many other qualities of great value in the struggle of life. They are too important an adjunct in education to be allowed to lose their influence by being carried to excess. Efforts should be made to regulate and control athletic exercises before a reaction sets in against them.

Prof. Watson's paper entertained strongly the same opinions as were expressed in the previous paper. He could not speak too emphatically of the importance of physical culture as well as good hygienic surroundings. He believed that very great advancement had been made within the last two decades, especially in understanding the laws of physiology and hygiene. The results already achieved offered great promises for the future. He believed that the period for physical training should begin very early in the life of the child, and that mothers should have some definite and intelligent idea of this subject. The character of the exercise must depend almost entirely upon the individual. The great value of any form of exercise came only from systematically and logically continuing it. The elements of success also required an extensive and varied system, adapted to all ages, classes, and conditions of life. Vocal gymnastics, though generally neglected, were of very great importance, as the respiratory organs and the organs of speech were as capable of development, by practical vocal exercise, as any other class of organs. The lack of good vocal development is everywhere manifest. At no time in the history of civilization has physical exercise been so greatly demanded as at the present time; the habits and customs of the present civilization make it an imperative necessity.

In the early days of existence, when man had to establish his dominion over the beasts of the field and the brutes of the forest, when the inferior tribes, hardly emancipated from the lower forms of life, crept out of caves and huts to see the nobler races go forth to exercise those rude arts of war, hunting and revelling, which alone marked their standard of civilization, there was a nobility, sprung from necessity, which richly deserved the name.

But now, to live for nothing but hunting, fishing, boating, and athletic sports,—now, when these arts have degenerated into childish imitations,—*to live* for them is simply ignoble. The cultivation of human muscle, of brawn without brain, of professional athletes, for gamblings and public struggles for money or fame, is degrading,—a crime against humanity.

Both of these papers were replete with sound common-sense, and were full of wholesome advice, deduced, evidently, from a careful and comprehensive study of the subject of physical training.

SCHOOL HYGIENE.

A valuable paper upon school hygiene was read by Prof. Charles J. Lundy, of the Michigan College of Medicine. He attacked vigorously many of the current evils of school life, especially such as are found in many of our cities. The character of the school-room itself, the methods of teaching, etc., received a careful and critical examination. In some of the city schools the scholars were greatly overworked, as shown from investigations, in many instances from ten to thirteen hours per day being spent in study and recitation. This condition of affairs was not found in the country. He believed that competitive examinations for prizes should be condemned without qualification. He regarded it as a pernicious practice, which not only excited a sharp rivalry, but resulted in the superficial cramming process for a few days or weeks before the examinations for the purpose of passing successfully. It subjected the pupil to a mental strain which could not be otherwise than detrimental to his health. He says,—

Why do so many pupils drop out of the classes, and leave school at the end of one, two, or three months after the beginning of the school year? It was shown in the New York schools that the average attendance was less than 50 per cent. of the number of pupils enrolled. It was estimated that three fourths of this absenteeism was due to sickness. Of course,

much of that sickness was in a measure unavoidable, or, at least, was not due to school work. But that much of this sickness and absenteeism was due to cramming and overwork there can be no reasonable doubt. The experience of every physician will bear testimony to the correctness of this statement. Indeed, the timely interference of the physician, in advising weak, delicate pupils to leave school, often averts the impending danger of prostration from overwork. Need I say that nervous excitability, with ultimate prostration, headaches, impaired digestion, lack of proper physical development, and myopia, are among the many bad results of the exciting competition and the long hours of study, especially when much of the pupil's time is spent in badly lighted and badly ventilated school-rooms.

The importance of thorough ventilation of school-rooms cannot be overestimated. With a large number of pupils in a single room, the atmosphere soon becomes contaminated by exhalations from lungs and skin. In many schools the lack of proper ventilation is painfully manifest, especially in winter months. I venture the assertion, and without fear of successful refutation, that not one in three of all the school buildings in this great state of Michigan is properly lighted and properly ventilated; this, too, in a state that is a most liberal patron of education—a state noted among all states as having a superior educational system. And what is true of Michigan schools is true of the schools in other states.

To compensate for the lack of proper ventilation, teachers sometimes resort to opening the windows of the school-room to admit fresh air. It will at once be seen that this remedy is as bad as the defect it is intended to correct. A draft of cold air is allowed to blow directly upon the pupils who sit in proximity to the window: the body is suddenly chilled, and a cold is the result. When the body is at rest the surface is easily chilled, and under such circumstances the pupil catches cold (in the ordinary acceptance of the term) from comparatively slight causes. Repetitions of these colds lead to chronic catarrhal affections of the nose, throat, and ears. In this connection I may say, that in many cases the temperature of the room becomes too high, owing to imperfect ventilation. In the majority of school-rooms the temperature ranges from 70° to 76°, or even 78°, whereas it should not be more than 68° or 70°. In Europe a temperature for school-rooms of 68° is thought quite high, and a much lower temperature usually prevails. The warm atmosphere is injurious and unhealthful, and relaxes and debilitates the system. When pupils leave a warm, dry atmosphere, with pores open and systems relaxed, and go directly out into the damp frosty air of a midwinter day, they are very liable to suffer in consequence. This it may be impossible to entirely avoid; but if the temperature of a room is 68° or 70°, and the atmosphere is pure, the system is not so likely to be relaxed as it would be by an impure atmosphere of 76° or 78°; and every careful observer knows that

when the system is relaxed is a time of great danger from sudden exposure to a cold atmosphere.

The construction of the seats and desks, their position, and the number admissible in a given space, were also reviewed. Dr. Lundy being himself a specialist of the diseases of the ear, eye, and throat, gave a lengthy discussion upon the question of light in the school-room, and the relation of short-sightedness, or myopia, which is so prevalent at the present time among the young. Myopia is a disease of the educated. It is almost unknown among the lower and uneducated races. Among the lower classes of India it is seldom seen, and Dr. Macnamara, in his investigations among the aborigines of Bengal, did not find an instance of short-sightedness. Among the colored people of this country it is exceedingly rare. In this country, in England, and in Germany it is found principally among the better educated classes. In Germany this condition prevails more extensively than in any other country. Drs. Loring and Derby, in their examinations of the pupils of the New York schools, found among the Irish pupils 18 per cent., among the American pupils 19 per cent., and among the German pupils 24 per cent., afflicted with this disease. Of the causes of this defect, he says,—

Chief among the exciting causes of myopia are close application to study in early youth, while the tissues are lax and infirm; long hours of study without proper periods of rest; and poor light, both in quantity and quality. Other causes are congestion of head, face, and eyes, caused by the stooping position, or by tight clothing, or by cold feet; badly printed books, and books in which the print is too small; badly ventilated school and living rooms; debilitating influences of whatever nature; and lack of proper physical exercise in the open air.

Hereditary diseases are now frequently found in the children of myopic parents. The causes which produce short-sightedness are far more prevalent in the city than in the country.

Dr. Cohn, of Breslau, Germany, found only 1.4 per cent. of myopic pupils in the village schools, while among pupils of the same age in the city schools the per cent. of myopia was seven times as high. The per cent. of myopia increased year by year, until in the thirteenth and fourteenth years of school life almost two thirds of the pupils were myopic.

Dr. Conrad, of Koenigsburg, found that myopia increased from less than one half of 1 per cent. at seven years—the first school year—to more than 62 per cent. in the highest classes.

Dr. Erisman, of St. Petersburg, found myopia to increase from 13 per cent. in the preparatory class to 41 per cent. in the fifth class.

Pfluger found in the schools of Lucerne a condition almost identical with that at Koenigsburg.

In the gymnasium of Vienna, Reuss found almost 60 per cent. of myopic students in the higher classes. Had not many students been compelled to discontinue their studies on account of the condition of their eyes, the per cent. of myopic students in the highest classes of the gymnasia would undoubtedly have been larger.

The length of time which pupils spend in study bears an important ratio to the percentage, as shown by Erisman in his statistics upon this subject.

Of 4,358 pupils examined by him, all studied two hours out of school, some studied four hours, some studied six hours, and some studied more than six hours out of school. Of those who studied only two hours out of school, 17 per cent. were myopic; of those who studied four hours, 29 per cent.; and of those who studied six hours or more, more than 40 per cent. were myopic.

By avoiding as far as possible the conditions which have been enumerated as causing this disease, it may be prevented in a great measure. Once established, it cannot be cured, because certain anatomical and pathological conditions have taken place in the structure of the eye. He also discussed at some length the subject of physical culture, and expressed substantially the same views set forth in the papers which were given upon physical training. In closing his paper, he gave the following as rules which would materially assist in remedying the existing defects:

1. Avoid the cramming process in education, and the nervous excitement due to the spirit of rivalry.
2. Reduce the number of subjects in the curriculum, and shorten the periods of study.
3. Ventilate the school-rooms in accordance with the best methods.
4. Regulate the temperature of the school-room. An atmosphere which is too warm debilitates the system.
5. Provide properly constructed and arranged seats and desks.

6. Instruct pupils to sit erect, and to hold the book or paper at least twelve inches from the eye.
7. Provide highly myopic pupils with proper spectacles, which will enable them to read at the natural distance of twelve inches.
8. Furnish pupils with well-printed books.
9. Furnish abundance of light without producing glare. Let it come from the left side if the room is narrow; from both sides if the room is wide.
10. Provide for the physical education of school children, and teach them the importance of out-door exercise.

ADULTERATION OF FOOD.

The next series of papers was upon the subject of food supplies and adulteration of food, the first being by Dr. William K. Newton, of Paterson, N. J. This able paper will be given in another part of this report, hence comment is unnecessary. The second paper was by Prof. Albert R. Leeds, of Hoboken, N. J., and, though discussing the question somewhat briefly, was similar in character to that of Dr. Newton. He also discussed the subject in its legal aspect, as applied to his own state and New York. He stated many methods of adulteration, and in many instances named the adulterants. These frauds are so extensively practised as to demand the immediate action of every state. Even the commercial foods for invalids and children were badly adulterated. No punishment is too severe for the parties engaged in these death-dealing frauds. He believed that the tentative period is now past, and should be followed by vigorous action which would bring about practical results. The extent of such adulterations could only be conceived by those who have been engaged in the work of analysis or in making special examinations into this subject. Those states which have as yet done nothing in the matter—except possibly to enact laws which remain as dead letters—are now the favored fields for adulterated foods. So artistic have become the methods of adulteration that they can be detected only by analysis in the hands of those qualified to do such expert work. To do this successfully requires of the state not only authority, but liberal appropriations.

SANITARY SCIENCE.

A paper was read by Dr. James E. Reeves, secretary of the State Board of Health of West Virginia, entitled "The Eminent Domain of Sanitary Science, and the Usefulness of State Boards of Health in Guarding the Public Welfare." This paper reviewed the history and progress of sanitation from the time of the old Mosaic code, and showed the great advancement that has been made within a very few years.

In discussing specific subjects he says,—

It should be impressed upon the attention of school children that the diseases which kill them in greatest numbers have been classed by wise men as Filth Diseases; that small-pox is easily preventable by vaccination; that scarlet fever, diphtheria, typhoid fever, yellow fever, cholera, and even pulmonary consumption, are preventable by cleanliness and correct habits of life; that there are farm-houses in all parts of the country, groups of houses in every community, whole villages, sections of towns, and districts in cities, where slovenliness and filth so much abound that sickness in some form is present at all seasons of the year; that filth does not only infect the atmosphere immediately surrounding its accumulation, but can and does transmit its germs afar; and thus it has again and again happened that whole families, with every apparent surrounding of cleanliness, comfort, and luxury, have sickened and died from infection received through the channel of some drain inlet, or the medium of the common water supply.

One of the highest and noblest duties of all governments is to look carefully to the physical welfare of its people. The individual, without the coöperation of the state, is practically helpless in this work, at least so far as its influences extend to the community. He quoted Lord Stanley as saying that,—

"Sanitary studies belong to the patriot no less than to the philanthropist. Don't fancy," said he, "that the mischief done by disease spreading in the community is to be measured by the number of deaths which ensue: that is the least part of the result, as, in the battle, the killed bear but a small proportion to the wounded. It is not merely by the crowded hospitals, the frequent funerals, the destitution of families, or the increased pressure of the public burdens, that you may test the sufferings of a nation over which sickness has passed; the real and lasting injury lies in the deterioration of race, in the seeds of disease transmitted to future generations, in the degeneracy and decay which are never detected till the evil is irreparable."

The English have already advanced far beyond us in this matter ; they not only make, but enforce, the laws for the protection of the public health. In referring to the lack of interest which we as a nation have manifested in the subject of sanitation (although within a short time an impetus has been given this work) he says,—

The state erects imposing and costly edifices for the detention and punishment of criminals, for the education and care of the blind and deaf, and for the treatment of the insane. To support such establishments, with all their necessary appointments, hundreds of thousands of dollars are annually paid out of the public treasury, and the burden of taxation for that purpose is constantly increasing. Why not enact statutes to diminish the factors which furnish such charges to the state ?

The law is singularly inconsistent in its protection and punishments. If a man commit murder, he may either be hanged or sent to the state prison for life ; but preventable disease—scarlet fever, diphtheria, typhoid fever, small-pox, and other death-dealing agencies—may stealthily enter the household, kill the family, and be innocently regarded as an act of Divine Providence !

The poor pilferer in a dwelling-house at midnight may be in a state of starvation at the time he lays a trembling finger on something to eat in the larder, or on a silver waiter on the side-board, but, notwithstanding the pressure and desperation of hunger, if discovered in his trespass and theft he is sent to prison, and his family disgraced thereby ; while the incompetent architect, the plumber, and, alike, the ignorant doctor, may enter in broad daylight, aye, even by *call*, and steal and destroy the life and health of the occupants.

The law makes common carriers responsible, regardless of accident, for damage done either to person or property ; yet an American citizen may refuse the protection which vaccination affords against small-pox, carry that loathsome disease into a community, and start an epidemic.

If a pitfall be left in the street or public highway, and the citizen, his horse, or his ox fall into it and is injured in any manner thereby, he may sue in a court of justice, and recover from the town, city, or county, as the case may be, a sufficient sum of money to compensate for the damage sustained ; but the same citizen may sicken and disable his own family, also the family of his neighbor, by accumulations of filth on his premises, and escape all legal responsibility.

Again : municipal ordinance says, that in order to avoid injury to persons and property, a locomotive engine and train of cars shall not exceed a speed of six miles per hour within the corporate limits ; yet the same authority of law permits open cesspools, filthy streets and alleys, a con-

taminated water supply to families, and the constant breeding of infectious and contagious diseases to kill the people.

And again: to prevent litigation and strife among her citizens, the state has even gone so far as to prescribe the very words to be used in the purchase or transfer of property by "Richard Roe" or "John Doe." Why not the same particularity and care to prevent the rise and spread of sickness among the people?

VITAL STATISTICS.

Dr. Albert L. Gihon, medical director U. S. Navy, read a brief paper upon "Vital Statistics as Sanitary Monitors." In this paper he expressed the opinion that statistical investigations bearing upon vital questions were of the greatest importance in determining questions within the domain of sanitary science. He deprecated the building up of huge piles of figures with no definite idea of their purpose. Statistics legitimately compiled were of inestimable value, especially those relating to the movements of society. Statistics that show how many are born and how many die are valuable, but tables "that show how many are sick and why they are sick, though it be not unto death, are sanitary monitors which the most reckless liver would not dare disregard, nor the most incredulous scoffer at science care to butt his own numskull against." The entire paper was pithy, and a strong plea for statistics that may be of some practical value.

HOUSE SANITATION.

A paper was presented by Rudolph Hering, C. E., entitled, "Essential Features of House Drainage, and Practical Points regarding its Design and Construction." This paper was somewhat lengthy, and discussed in detail the methods as well as many of the apparatus required in properly sewerage and draining a house. The length of this paper will preclude a concise review of it; suffice it to say that the name of the author is a sufficient guaranty of its character and ability. He gave the following as the cardinal principles in the arrangement of perfect house drainage:

1. A rapid and thorough removal of all liquid and suspended matter from water-closets, kitchens, sculleries, bath- and bed-rooms, etc., so that there is no cessation of flow, no eddy or deposit, from the moment the matter enters the pipes to the moment it leaves them.

2. The prevention of an escape into the house of any air contained in the pipes under all the varying conditions of temperature, of the use and disuse of the different fixtures through evaporation, and the forcing or drawing of the water-seal in any traps.

3. A careful selection of the fixtures and the material to be used, and faithful workmanship in the making of all joints, and the proper supporting and securing of every part of the work.

A paper upon "House Sanitation" was presented by Dr. Joseph H. Raymond, of Brooklyn, N. Y. This paper also discussed the essential requirements of house drainage. He believed that in cities this should be regulated by law, and a critical supervision exercised over the sewerage of all houses. The experiences of our larger cities have demonstrated the necessity of such a law. In 1876 the Brooklyn Board of Health undertook to secure the passage of such a law in that city, which was the first effort of the kind in this country. Since then many cities have placed the drainage of houses under municipal control. Of some of the results of such a law in Brooklyn he says,—

During the past year and a half there have been constructed in the city of Brooklyn three thousand buildings, in which the plumbing has been executed according to an approved plan, and under such supervision that everything, even to the very joints in the pipes, has been examined by a competent plumber in the employ of the city before it has been hidden from sight by the work of the carpenter and mason. Nor has the task been a difficult one. It has required painstaking care and a knowledge of the tricks of the trade, but no obstacles have been met which have not easily been overcome.

No trickery is so despicable as the fraudulent work of the unscrupulous plumber, and the necessity of such work being regulated by law has long been apparent. Many cities have taken advanced ground upon this subject, and have proven by the results of their work the great value and importance of exercising a legal control over this class of work.

Dr. William Oldright, president of the Provincial Board of Health of Ontario, read a brief paper upon "The Overhead Ventilation of Sewers." The principle advocated, which differed more essentially from the methods usually employed, was the continuing of a pipe from the sewer just outside of the usual

trap located in the sewer near the walls of the building, to the top of the building itself, thus making the sewer continuous as high as the top of the chimneys. This would serve the purpose of ventilating the sewer without carrying the ventilating-pipe up through the building, as is the case when the sewer is ventilated from the soil-pipe itself. This method would undoubtedly thoroughly protect the house from sewer-gas, although it would considerably increase the expense of sewerage a building. In ventilating the soil-pipe of the house he recommended that from the ventilating flue outside the buildings, between the building and the sewer trap, a pipe be carried to the top of the house. In winter the inside warmth would create a current which would descend the outer pipe and ascend the inside or soil-pipe. In the summer, when the interior of the house is often the cooler, the warm rays of the sun would increase the temperature of the outside pipe, thus reversing the current, so that, theoretically, there would be a current passing in one direction in the summer, and in another direction in the winter. The article is accompanied by a diagram which thoroughly illustrates the method.

MISCELLANEOUS PAPERS.

A paper by Oscar C. DeWolf, M. D., entitled "Pullman from a State Medicine Point of View," was presented. This paper was intended to show the sanitary points in the construction of the city of Pullman, near Chicago. It was founded by George M. Pullman, Esq., of sleeping-car fame, and was intended for a home for his employes. This city was built in all respects upon the most modern sanitary principles, and the details of its construction, sewerage, health of the inhabitants, etc., were exhibited. The town has 7,500 inhabitants, and its average annual population has been 5,000. The city has been built two years, and its annual death rate has averaged 6.9 per 1,000.

Several other valuable papers were presented, among which was one by E. H. Janes, M. D., on "Typhus Fever in New York City;" one by R. B. S. Hargis, M. D., on the "Pensacola Yellow Fever Epidemic of 1882;" one by J. M. Partridge, M. D., of Indiana, on "Swine Plague, or Hog Cholera;" and a very interesting paper on the "Increase of Insanity in the United

States: its Causes and its Sources," by Foster Pratt, M. D., of Kalamazoo, Mich.

VACCINATION.

The report of the Committee on Compulsory Vaccination, prepared by Eugene Foster, M. D., of Augusta, Ga., was an exceedingly valuable and exhaustive paper upon this subject, embracing over fifty printed pages. The paper carefully reviews the history of small-pox, and the opposition to, and the efficiency and safety of, vaccination. No brief review would do this paper justice. It was regarded as being of so valuable a character that the State Board of Health of this state authorized the printing of one hundred and fifty copies, which are to be placed principally in the town libraries of this state for the purpose of reference by those who desire to know the history of this subject.

This association has already published nine large and beautiful volumes, which are in themselves a library upon sanitary matters, and are of inestimable value to those interested in sanitary work. A volume is now published annually, and is worth to any one the cost of membership.

The executive work of the association is largely in the hands of the advisory council, which consists of a member from each state. The work of this council is passed upon by the executive committee, which consists of six elected members besides the regular officers of the association. The next meeting of the association will be held at St. Louis, Mo., Oct. 14-17, 1884, to which reduced rates can be secured by addressing the secretary. The officers for the present year are as follows:

President—Dr. Albert L. Gihon, U. S. N., Washington, D. C.

First Vice-President—Dr. James E. Reeves, Wheeling, W. Va.

Second Vice-President—Hon. Erastus Brooks, Richmond, N. Y.

Secretary—Dr. Irving A. Watson, Concord, N. H.

Treasurer—Dr. J. Berrien Lindsley, Nashville, Tenn.

MISCELLANEOUS SUBJECTS.

TYPHOID FEVER AT THE BLACK MOUNTAIN HOUSE, CAMPTON.

During the summer of 1883 there appeared at this house several cases of typhoid fever, the cause of which was at first somewhat obscure. It was charged that the drinking-water of this summer resort must be impure, or the sanitary condition of the premises not what it should be. A careful investigation was made to ascertain whether or not such suspicion was true. The importance of maintaining good sanitary conditions at places of public resort could not be overlooked: hence it was deemed necessary to ascertain all the facts in the matter.

It was found that a mild case of typhoid fever had come to this house from another state, but was not recognized as true typhoid fever until others had become infected with the disease. The proprietors of the house (Buchanan & Willis) were very desirous to ascertain all the facts, that the imputations placed upon their house might be removed. Samples of the water used at their house were sent away for analysis. The following letter from Dr. Woodward, of Worcester, written to one of the proprietors, shows the result of the analysis:

WORCESTER, November 23.

MR. C. M. BUCHANAN:

Dear Sir:—Dr. Kinnicutt made a full report of his analysis of the Campton water yesterday. He finds all three specimens of water pure, and free from any vault contamination. The spring water is exceedingly pure, and the Mitchell well, which contains more organic matter than either of the other specimens, is considerably purer than the best New England city waters,—which, of course, is saying a great deal, as New England has as good water as any part of the world.

The purity of a water is determined by the amount of organic matter contained in a given quantity, and the form in which this organic matter is found.

Vault contamination always shows itself by an increased amount of *chlorides*, and this increase will be shown by analysis for several years after the source of contamination has been removed.

Sink drainage shows itself in a water by increasing the free ammonia and the albuminoid ammonia.

Now the Mitchell well, which is the most impure of the samples, shows .2 of chlorine in 100.000, and .003 of ammonia in 100.000.

This is practically as pure a water as is found in any ordinary well, for all waters take up a certain amount of organic matter in passing through the air and flowing through or over the surface of the earth.

The spring water is much superior to the well water in its general purity, but is slightly contaminated by organic matter, presumably vegetable, from the spring. The presence of chlorine, which is all that we care about in studying the cause of the typhoid fever, is so *very* small that the water may be considered *absolutely pure*.

We have now settled beyond a doubt the question of the purity of the water, and must look to some other cause for the epidemic of last summer. In my own mind I have no doubt that the disease was imported by the P—— child from T——, and spread through the Black Mountain House from carelessness on the part of the attendants in not disinfecting the discharges from the bowels, and from your lack of drainage, which allowed the germs of disease to remain on the surface of the earth about the house, in close proximity to the rooms occupied by the guests and kitchen, ice-house, etc.

Yours very truly,

L. F. WOODWARD, M. D.

Among the physicians who saw these cases was Dr. G. H. Lyman, of Boston. Regarding his opinion of much weight in the matter, the secretary wrote him for particulars, and received the following letter, which is substantiated by the evidence given by the local physicians :

BOSTON, October 30, 1883.

DEAR SIR :

I can give you nothing very definite as to the typhoid cases at Campton. Something like a dozen cases occurred, I believe. They broke out *simultaneously*. The one I was called to see was, properly speaking, cerebro spinal meningitis,—that is to say, there was no time for the manifestation of ordinary typhoidal symptoms, and if it had occurred alone I think typhoid would not have been suspected. But I am now of opinion that typhoidal poison was the *fons et origo* of the case. I made a careful inspection of water, with soil, drainage, etc., and could find nothing in them to account for the sudden epidemic. Some two or three weeks previous there had been a patient in the house *who was sick with the disease on her arrival*, and in the absence of any other cause I am compelled to attribute all the cases to infection from that individual. The dejections must have been carried—very carelessly, probably—through the entries of the house, to be emptied into the vault at the rear. Many such cases have occurred

in the last ten years in public institutions, among attendants who, in disobedience of orders, have been careless in disposing of typhoidal dejections. If there are any other and specific questions which I can answer I shall be happy to do so.

I am very respectfully yours,
DR. WATSON, Concord.

G. H. LYMAN.

The investigation fully refuted the charges of bad sanitary conditions, and proved beyond a doubt that the cases were due to infection through causes mentioned above.*

DIPHTHERIA AT PETERBOROUGH.

The following letter was received from one of the physicians of Peterborough, on the day following its date, and is self-explanatory :

PETERBOROUGH, N. H., June 21, 1883.

DR. WATSON :

Dear Sir : Diphtheria has appeared in our village, and it has assumed almost an epidemic form. It first appeared at a neat and tidy farm-house, some half a mile from the village. All the members of the family had the disease, and it proved fatal to one member, aged about twelve years. The next case appeared in the village, in a good healthy locality. One member in this family was very sick with it. It then appeared on Concord street, and one member in this family died. Without going into details, it appeared in four or five other families in various parts of the village ; so it cannot be attributed to any local cause, as it is distributed over a wide space of territory. But this fact is very singular : it appeared only in those families that got their supply of milk from this farm-house where it first broke out. I understand that the milk is not brought into the house, but is kept in an out-house. But I understand that the cows get their supply of water from the same source that the family get theirs, and that the water has become polluted by a sink-drain. I have not investigated the matter, and this latter statement may not be true.

It seems to me that it is of sufficient interest for the Board of Health to investigate. If you should see fit to come here we will render you all the help we can.

Yours respectfully,

W. D. CHASE.

I should say that at the present time there are eight or ten sick with the disease, perhaps more. C.

* Some months subsequent to this the entire buildings were burned to the ground ; but, owing to the fact that the proprietors propose to rebuild, this report is allowed to remain.

The secretary immediately proceeded to investigate the cause of this outbreak of diphtheria by requesting the physicians of that town to report their cases to him, and also by a personal visit to the locality.

The disease first appeared at a Mr. K.'s, about one mile out of the village, at a farm-house. Mr. K. is an enterprising farmer, and keeps a sufficient number of cows to supply a part of the village with milk. This fact, taken in connection with the cases in his family, led many to suspect that the disease was spread through the town by the use of milk infected at his place. An investigation showed that much which was charged against these premises was unfounded, especially after the appearance of the disease in this family. Special pains was then taken to put the entire premises in at least a fair sanitary condition.

The cellars were thoroughly cleansed, and the collections in the cellars of the stables removed, and the whole well ventilated. The cows were in the pastures during the day, and at the stables at night. The water which supplied both the stables and the house was from a well or spring some fifty or seventy-five rods distant, upon a good elevation, and so located as to be secured against contamination from drainage.

That the local conditions might have been such as to have developed the first case of diphtheria is not improbable. A close inquiry into the cases that followed showed that the disease could not have been communicated to all, if to any, through the medium of the milk supply. The report of Dr. Ober sufficiently touches upon this point:

PETERBOROUGH, N. H., July 7, 1883.

DR. WATSON:

Dear Sir: As I have learned that you have been here to examine Deacon Knight's house and surroundings, I deem it best to write you that I attended those diphtheria cases, as well as others, and I send you a report of eighteen different sicknesses, in sixteen persons, from which I think you will see how very little evidence there is that the milk from Deacon Knight's farm has been the cause of the twenty-five or thirty diphtheretic cases in this village. * * * * *

At the request of Dr. J. H. Cutler, I have sent him a report exactly like the one I enclose to you, and Deacon Knight earnestly desires you to make a public report soon.

As I am a stranger to you it will be proper for me to state that I am a regular physician—a graduate of Dartmouth college, and of the University Medical College of New York city. I practised in Lowell, Mass., three years, and was attending physician at St. John's Hospital, as well as one of the staff of the City Dispensary. Am a member of Massachusetts Medical Society, and have practised in this place during the last eighteen months.

Yours respectfully,

CHARLES F. OBER, M. D.

DR. OBER'S CASES.

No. 1.	A. K., malignant diphtheria,	.	.	.	.	.	died.
2.	K. K., diphtheria,	.	.	.	.	.	recovered.
3.	M. K., severe diphtheria,	.	.	.	.	.	"
4.	Mr. K., diphtheria,	.	.	.	.	.	"
5.	W. K., diphtheria,	.	.	.	.	.	"
6.	W. W., diphtheria,	.	.	.	.	.	"
7.	Mrs. S., dip. sore throat,	.	.	.	.	.	"
8.	M. H., dip. sore throat,	.	.	.	.	.	"
9.	Mrs. J. C. S., severe diphtheria,	.	.	.	.	.	"
10.	J. W. dip. sore throat,	.	.	.	.	.	"
11.	C. H., " " "	.	.	.	.	.	"
12.	A. H., " " "	.	.	.	.	.	"
13.	W. M., " " "	.	.	.	.	.	"
14.	Mrs. M., " " "	.	.	.	.	.	"
15.	A. H., " " "	.	.	.	.	.	"
16.	J. M., " " "	.	.	.	.	.	"

Note 1.—Only the first nine cases have had any of the K—milk, and of those the first seven persons were at the K—house, as W. W. worked there all the time, and Mrs. S. (No. 7) worked there a few days, doing the washing there (after A. K. died), and "taking cold" while doing it.

Note 2.—Only two cases (8 and 9) out of my sixteen were in families on Mr. K.'s milk route; and of those two, I think that case 9 (Mrs. J. C. S., severe diphtheria) can, in a great measure, be accounted for by the local surroundings; and I will add the fact, that I attended a severe case of typhoid fever in the same tenement, though not in the same family, last August and September, which finally recovered. I made a careful examination of the surroundings at that time, and pronounced them in a bad condition, and some improvement has been made in them since.

Note 3.—W. K. (case 5) had diphtheretic sore throat about six weeks before he was taken with diphtheria, and again two or three weeks after

he had sufficiently recovered from the diphtheria so that he had resumed work in Mr. B.'s shop.

Thus I have attended eighteen different sicknesses this spring, which were either diphtheria or diphtheretic sore throat (see above), in sixteen different persons, with one death, the malignant case.

Note 4.—I have strong reasons for believing that in most, if not in all, of the cases attended by the other physicians, sufficient cause for the disease can be found from unsanitary conditions at or near the different houses.

CHAS. F. OBER, M. D.

DR. MAYO'S CASES.

	Milk.	Drainage.	Cellar.	
Mrs. R. S.,	K.'s	good	dry.	Think this case direct contagion.
G. E. S.,	"	fair	"	Died.
Mrs. F. S.,	"	"	"	Direct contagion.
G. S. T.,	"	good	"	
Mrs. C. J. S.,	"	"	"	
E. B. F.,	"	"	"	
H. W.,	"	passable	damp but clean.	
W. S.'s child,	"	"	"	Died.

I have had several cases of tonsilitis, but these eight cases were all genuine diphtheria. Mr. T—— got thoroughly drenched with rain and severely chilled, to which his case might be attributed, as he never drinks milk. I have simply stated the facts as I gained them at the time of attendance. I think my memory serves me right.

Very truly,

J. H. MAYO.

Without going into the history of this epidemic, we would say that the summing up of all the evidence obtained and presented in the cases leads to the belief that the milk was not the cause of the spread of the disease; but in what manner the germ or poison of the disease was communicated, we are unable to state. Dr. Ober, as he above expressed, is of the opinion that in a majority of cases the sanitary conditions were sufficiently bad to account for the disease. In some of the cases the evidence of direct contagion was so strong as to leave no doubt in the matter; in other instances it was impossible to determine its origin. It is possible that the conditions necessary for the production of the disease were present in those localities where the outbreak occurred, and that the cases were spontaneous.

However, such a theory, when all the circumstances are taken into account, is not so probable as that the conditions were right for the development of the disease after its first introduction.

The secretary is largely indebted to Dr. J. H. Cutler, of Peterborough, for his courtesy in assisting in the investigation of this matter. After a thorough examination, he concurred in the views above expressed.

DIPHTHERIA AT CONTOOCOOK.*

On December 12 I was called to attend my first case of diphtheria, my patient being a little girl of six years. The attack proved a mild one, the symptoms soon abated, and the little patient became convalescent. On the 20th another case occurred in a young lady of thirty years, which proved a severe one. A day or two afterwards a young man of twenty, and two or three miles distant, was also taken down, which also proved severe, and was somewhat protracted. From this time the disease became epidemic. Three and four new cases a day were not an unusual occurrence; and finding myself in the midst of this pestilence, a careful search was at once instituted, to discover if possible the origin of this trouble. A young lady of twenty years had died somewhat suddenly of supposed typhoid fever. The body was kept for nearly a week, and a public funeral held on Thanksgiving day, which was generally attended by the young people of this community. In conversation with friends, it was stated that the patient complained of a severe sore throat some twenty-four hours previous to her sudden demise, and after death a peculiar appearance of the lips and also of the nose was noticeable, and was of a greyish color. My first case was less than a quarter of a mile from where this death occurred, and a near neighbor; the second was about the same distance from case No. 1;—both attended the funeral. As to whether this patient might not have had diphtheria, and which may have contributed to her sudden demise, is a subject open for discussion, with a possibility that from this case originated the disease which has generally prevailed through this village and immediate surroundings.

* Reported by Dr. George C. Blaisdell.

From close observation as to the etiology of diphtheria, I am inclined to believe that the contagious principle is an element capable of floating in the atmosphere. Whether it may be classified with the writings of Oertel, Letzerich, and others, who claim that a minute fungus floating in the air is the cause of contagion, or with Dr. MacLagan and more recent writers, who explain all phenomena by the germ theory, shall make no effort to explain.

On one occasion my attention was called to a case where a complaint was made of a severe stinging sensation in the right tonsel. An examination showed an unusual redness, which was soon followed by the appearance of false membrane. By the application of remedies this patch exfoliated in from eight to ten hours, leaving the throat inflamed, and followed by very little if any constitutional symptoms. This case was one of several, and shows conclusively that the poison was received from the atmosphere. As to what the specific poison was, am contented to place in speculative hands the solving of this problem.

Symptoms generally were akin to a severe attack of influenza—severe headache, pains in back and loins, with giddiness; complaint was soon made of dryness of the throat, followed by slight pain in swallowing, and occasionally by feelings of stiffness and tenderness of the muscles of the neck. Upon inspection of the fauces an unusual appearance of redness was apparent, which was followed in a few hours by the appearance of the membrane. Soon after this the temperature would rapidly fall, in some instances reaching 103 2-10, then down to a degree or more below normal. The patient then usually refers nearly his entire troubles to his weakness, frequently complaining of a loss of strength and ambition. Changes in the weather usually served to increase the temperature, which was invariably followed by an increase of false membrane in a number of cases. Rheumatic pains were so severe as to require treatment, affecting more particularly the muscles of the upper extremity.

Cardiac troubles were not usually a complication. In several of the cases they were noticeable, and in one or two they required treatment, being somewhat severe. The average attendance was from ten days to a fortnight, while two or three

severe cases required three or four weeks. While a majority of the cases were ushered in by more or less severe symptoms, others were stricken down at once, and obliged to go to bed.

Another feature of the disease was that almost the entire number of cases were confined to adults; very few children suffered and only one or two cases below ten years of age. The type of the disease was of the catarrhal or mild form, and after the disappearance of the exudation, the catarrhal symptoms were occasionally persistent. Those who were of the etrumous deathesis, were more severely afflicted than others, and in almost the entire range of cases hoarseness was generally absent.

Prognosis favorable. No cases died, although several were dangerously sick.

TREATMENT.

Those anxious for a remedy will find almost everything to be of service in relieving some one of the many forms peculiar to the disease. The treatment generally used in my cases was nearly as follows: Usually gave some cathartic to correct faulty secretions, and if the febrile symptoms were unusually severe, gave a few doses of aconite and gelsemium, which was generally followed by a mitigation of the fever. Soon as the feeling of weakness was complained of, or became apparent, tonics of iron and quinine, or *co. tr. cinchonia* were freely given, alternating with the *am. tr. guaiac*, just now so generally in use. For local treatment, and a very important feature in the management of the disease, was nearly as follows, *viz.*: Soon as the false membrane appeared a thorough application of the protoxide of mercury mixture was used twice a day, or as often as necessary, followed by a gargle of permanganate of potash. I believe no one medicine contains so much of real value as this for the local treatment of diphtheria.

Dr. Morrill McKensie, in his valuable pamphlet on diphtheria, says that an effort should be made to convert the "diphtheretic sore throat into a catarrhal sore throat;" and from a large number of trials I believe the remedy used as a strong gargle to be the best one at my command to accomplish the above results.

As to the influence of imperfect drainage there was no reason to attribute any of the cases in my list in any way to faults of

that kind. The season of the year might prevent as close an investigation as some others would allow.

Scarlet fever made its appearance almost simultaneously with diphtheria. The entire number afflicted were children. No adult to my knowledge contracted the disease. A considerable number were afflicted, with only one death, viz., that of a young child of fifteen months, which had the malignant variety.

The disease in general was of a more severe type than that of diphtheria, the majority of the cases being of the anginose variety in a severe form.

In a family of ten children, one of which died, and nearly all having the anginose variety in a severe form, one of the children had diphtheria, as well marked a case as was seen during the prevalence of the disease in this vicinity, which resulted in a few days in convalescence, and showed no symptoms of scarlet fever.

In some other cases the association of these two diseases, viz., diphtheria and scarlet fever, were apparent, and while admitting the adage that "misery loves company," and regretting as much as possible the intimacy, yet I am a firm believer in the fact that diphtheria and scarlet fever are two distinct diseases, and that the poison of one will not propagate the other; neither have I been able to diagnose the presence of each other in any patient at the same time. I gave this subject considerable study, and present my conclusions so far as my experience would allow during the prevalence of the epidemic. As to the subject of whether this disease is as contagious as many believe, or infectious as others insist, the writer leaves for those who love discussion. In nearly every family where a case appeared other children of the family were afflicted. This disease will undoubtedly occur more than once in young children when the attack is mild. As to the number of times one may have the disease I do not propose to discuss,—until, certainly, the patient has got enough, or the susceptibility of the system is exhausted. One of the cases was the subject of attack at two different times,—some three years ago, and again the present winter, with desquamation thoroughly marked in both cases. The treatment was not materially different from that generally used by a majority of the physicians of modern times.

CATTLE SICKNESS AT HAVERHILL.

About the last of March letters were received at this office asking for an investigation into some cases of supposed foot and mouth disease at East Haverhill, on the farm of Cyrus E. Noyes. The secretary, accompanied by the secretary of the board of agriculture, to whom a similar request had been made, visited the locality.

The following is a brief history of the three cases, which were all that occurred :

Mr. Noyes had a herd of twenty or more cattle, and when they were taken out of the pasture, about the first of November last, a yearling was noticed to be a little lame. This lameness was confined to one foot, and increased till the disease showed itself by open sores upon the hoof, from which there was considerable of a discharge. Local treatment was given, and the foot disease seemed to be improving, when, after six or eight weeks' sickness, the creature died.

The other two cases occurred in a pair of large oxen owned by Horace Eaton, but kept with Mr. Noyes's herd. These oxen were brought from Wentworth about the first of December ; commenced work with them, drawing wood, etc., the 24th of December, and used them until January 17. On January 14 Mr. Eaton noticed that one of them was lame in one of the hind feet. This lameness increased, and in a short time open sores formed about the hoof, which discharged bloody matter. There was a slight cough, eyes dull and suffused, saliva dripping from the mouth, and there were slight excoriations of the mucous membrane of the lips and gums. In attempting to hold the surviving ox to examine the mouth, bloody serum ran from the nostrils. The ox gradually declined, and after about five weeks' illness died. The one that was living at the time of our visit presented the same symptoms, and was taken lame about ten days after his mate. In this case the local disease was confined to one hind foot. A *post-mortem* examination of this ox was made the following day by Dr. H. P. Watson, of Haverhill, from whom no report has been received, although specimens of the foot, lips, and tongue were sent to this office for examination. The disease in the foot had involved the bones of the

locality, and had also greatly disorganized the soft tissues. An examination revealed no specific disease. It is the opinion of the writer that this case bore no relation to the contagious foot and mouth disease. It is probable that the local disease was the result of constitutional disturbances from a cause not discovered. The yearling was not isolated from Mr. Noyes's herd, and had the disease been of a contagious character, it would undoubtedly have spread through his herd.

The oxen were removed to the stable, a few rods distant from the rest of the herd. Similar cases have occurred in other localities of this state; and in the West numerous cases similarly described have been observed, and the cause thought to be the ergot fungi, which may grow upon grass as well as upon grain. Whether or not such a cause existed in this case is not known. Although these cases in some respects resembled the true foot and mouth disease, yet in others it was distinctly different, so that there is no hesitancy in saying that it was of a non-contagious character.

ENSILAGE *v.* MILK.

The following letter, which explains itself, led the secretary to ask of the writer a report upon the effect of ensilage on milk, so far as had come under his observation, to which the second letter given is the answer:

GOFFSTOWN, August 3d, 1883.

SECRETARY STATE BOARD OF HEALTH:

Dear Doctor: During last year, and thus far during this year, I have had a number of cases of disease among children, which have in some respects differed from ordinary cases of cholera infantum, so much so as to lead me to look for some special cause, which I imagine I have found in feeding children on milk from cows which have been fed upon ensilage. If you have ever tasted of the milk of ensilage fed cows in comparison with the milk of grass or hay fed cows, you must have noticed the acidity of the former; and the fact that I have a considerable number of cases every fall, winter, and spring, resembling the acute attacks of children in summer, due to milk-sickness, has led me to think that perhaps the milk was at fault. As an illustration, allow me to give you a sample case. Last winter my own little boy, then about twelve months of age, was being fed upon milk from a cow which had been having hay and grain, and was

digesting it perfectly. Owing to some cause, which I do not remember, it became necessary to change the milk, and the milk of an ensilage fed cow was substituted, and the little fellow was taken at once with symptoms of active indigestion, viz., vomiting of hard curds of milk, discharges very green, and accompanied by pain and prostration, etc. Suspecting the milk, it was at once changed, and the symptoms subsided without medication.

Considering that I have had cases occurring during the cold months, and occurring almost exclusively among children fed upon milk from ensilage fed cows, and that the attacks generally cease upon discontinuance of the milk, I was led to think that perhaps this might be of some account, and as my opportunities for investigation are limited, I concluded to write you.

Respectfully,

FRANK BLAISDELL, M. D.

GOFFSTOWN, August 18th, 1883.

SECRETARY STATE BOARD OF HEALTH:

Dear Doctor: Yours of August 6th received, and, in reply, I would say, that one cannot make an investigation of ensilage at this time of the year, as this is the time that the pits are empty, and are being refilled; but I will trespass upon your time enough to give a few facts obtained earlier in the season. I became much interested in this subject, as I thoroughly believe that most of our gastro enteric catarrhs are really cases of milk-sickness; and I believe that if we can educate our farmers so that they will realize something of the responsibility resting upon them, we shall not only help answer the question, "Am I my brother's keeper?" but shall take another stride forward in that greatest of all remedies, preventive medicine; for it is possible, through certain kinds of feeding, to produce certain results upon milk which act for the good or harm of the consumers, who we know are largely children.

Ensilage, from *en* (en) and *silo* (pit), can be composed of any of the grains, and most of the roots.

In this state ensilage generally means finely cut stalks of Indian corn. A pit is built of a capacity equal to the needs of the consumer, cemented on the bottom, ends, and sides. The corn is cut by a machine into lengths varying from one eighth to one inch, and emptied into the pit. A layer of this finely cut corn is then rolled, and tramped solid. Another layer is added, and so on, until the pit is full. Then on top are placed heavy planks, weighted by stones, the object of which is to so thoroughly press the contents as to displace the air. This is the most difficult part of the process, and is not often successful. If it were possible, a sweet, succulent food, instead of the sour, disagreeable smelling food that we find,

would result. I have examined quite a number of samples of this food, and so far it has all been sour, having a distinctly acid smell and taste.

Dr. George Thurbur says,*—"In the fodder corn we have a mass of succulent stems and foliage, in which preparation has been made for the production of grain. These are filled with juices, holding in solution the material that would soon be deposited in the grain, as starch, etc., but now largely in the form of sugar. When the corn plant is cut, and packed in the silo, fermentation, the first step in decay, at once begins. By the action of the oxygen of the air on the sugar and other contents of stalks, various changes take place, one of which is the production of carbonic acid gas." This gas Dr. Thurbur considers as preservative. "But if fermentation does not stop here (and it ordinarily does not), the sugar, which is first converted into alcohol, is soon changed into acetic acid or vinegar." This gives to the animals an excess of acid, which passes, as I believe, but little changed into the milk, making an acid fluid in place of one which would be alkaline, or, at least, neutral in its reactions. To satisfy myself upon this point, I tested a number of samples of milk from ensilage fed cows, invariably finding them acid. I tested with litmus paper, taking the milk from clean receptacles immediately after milking, or while still warm.

Now Hervieu says that a healthy child should consume, in twenty-four hours, sixty ounces of milk. If so large a quantity makes up the diet of a child,—and this often is the only food which the little one will have,—it naturally follows that the food should be as pure as possible, and to produce this result the animals from which the food is derived should be under the best possible conditions, chief among which is pure food, though not to the neglect of pure water, kind care, and clean barns.

Now the milk which is to make up the diet of a child should be really as nearly as possible like the breast-milk for which it forms a substitute. The breast-milk of a woman is alkaline, and it is only possible to produce an alkaline, or, at best, a neutral fluid in cows, by the best possible food, the cleanest of barns, the best of water, and the kindest of care. I believe that experiments prove that the milk from cows that are being fattened is the nearest to this standard.

Now I believe that one source of the gastro enteric catarrhs of children is in the milk furnished for food, or, in other words, the cases are often ones of milk-sickness, often produced by the change from the alkaline breast-milk of the mother to the decidedly acid milk of the ensilage-fed cow; and it has been my experience that in these cases, which often defy treatment, they will often yield to a radical change in the diet. It is my custom, when called to a case of cholera infantum or inflammatory diarrhoea in children, to at once substitute for the milk diet of the child oatmeal gruel, with some of the prepared animal foods, and my success

* See Silos and Ensilage, page 10.

has been such as to induce me to continue this treatment. Please do not understand me to mean that all cases of intestinal disease, characterized by vomiting and purging, that attack our children, are produced by milk, but I do believe that a considerable proportion of them may be so produced, and that these cases will be benefited by a change in the diet if that change will exclude milk.

Dr. Mayer, of Berlin, says* that this acid milk will not only produce diarrhoea, but cutaneous eruptions, and that, in substituting the milk from cows fed on potato refuse from brandy distillers for milk from stall-fed cows, he was often enabled to arrest the intestinal derangements. This may also in part explain the excessive infant mortality in our large cities, where the milk is carried miles in tin cans, subject to heat and constant shaking in carrying, and where the cows which produced the milk are fed for quantity rather than quality.

My conclusions, then, thus far, are, that while it is possible, by great care in preserving ensilage, to get a sweet, nutritious food, ordinarily care is not taken—that fermentation goes on until acetic acid is produced. This acid permeates the milk of cows fed on it, producing a fluid that is often dangerous in its effects.

My attention was directed to this by having cases of diarrhoea and vomiting, last winter, in children fed on ensilage-fed milk, which ceased when a change was made in the diet. I have not thought it best to take up your time with any report of cases, as they were simply cases of gastro enteric catarrh, or, as I prefer to call it, milk-sickness.

I would suggest that we carry with us a sheet of litmus paper, and when called to a case of this kind, in a child who has had a milk diet, to test the milk, and if we find it acid, to at once forbid its use.

You will readily see, Doctor, that there is a chance to do much work in this field. I hope, myself, to pursue my investigations during the fall and winter, as the study is very interesting, and I think will be productive of good results.

I beg your pardon for sending you such an incomplete set of facts, but I hope some interest will be awakened in this question, and if so, I shall feel amply repaid.

Very respectfully,

FRANK BLAISDELL, M. D.

To DR. I. A. WATSON, Sec. State Board Health.

Inquiries among those who have used ensilage fail to show any detrimental results. Hon. D. H. Goodell, of Antrim, has two large silos, and makes some three hundred tons of ensilage annually. This he feeds to all of his cattle, including quite a

*Routh on Infant Feeding, p. 153.

large number of milch cows whose milk is sold daily in Boston. He says that in no instance has any complaint been made because of the ensilage used. He believes that if such results occur it is due to feeding large quantities of ensilage with very poor hay or straw. In his feeding he gives, in addition to the ensilage given, some bone meal and one feed daily of good hay. His cattle have all thrived under its use, and the milk has been of the best quality. The fact that lactic acid is generated in considerable quantities in silos is well known, and it would not be unreasonable to suppose that the milk from cows fed upon such a substance should be acidified to a certain degree.

This subject is one of considerable importance; and it is hoped that any one who has additional light to throw upon it will give such information to the board.

RECORDS OF BIRTHS, DEATHS, AND MARRIAGES IN POSSESSION OF THE STATE.

Not until 1849 did the state make any attempt to place upon record a birth, marriage, or death. In its first feeble efforts to secure a return of such records, it is evident that no definite or matured plans were presented, and that the object itself was but poorly comprehended: the great purpose of a complete registration, with its manifold benefits, was not conceived. The result is, that the state up to nearly the present time is without the history of its people in their individuality; has no knowledge of the many conditions that have borne upon and directed the physical progress of their existence; can deduce no theories or establish any laws based upon the experiences of the people in matters of health and longevity; in fact, this particular field is almost a blank. The records of civil and military affairs leave to us the few scraps of genealogical history that we, as a state, possess, and these are of so much value that the state has preserved much of the same in its state papers and Revolutionary records now being published; but they are insufficient to give us any other data. The different departments are frequently applied to for information in this direction, but unless the name appears in connection with some official paper, nothing is to be found. Even if it should appear, the only fact shown is the individual's name, and possibly the record of some particular service, civil

or military. The deficiency is sadly felt, not only from an historical standpoint, but from a lack of reliable data affecting many of the important and practical questions, as well as matters of an urgent individual character. Had New Hampshire, since the organization of the state government, required of the towns a certified copy of all births, marriages, and deaths, and had the same been properly preserved, it would now constitute the most valuable records of the state,—replete with more history, more experience, more data for sanitary government, and more useful knowledge respecting the influence of climate, topography, occupations, habits, education, etc., concerning the welfare of our people, than can now possibly be obtained. The necessities, as well as other legitimate considerations which always come to a progressive people, have to a large degree awakened the thinking minds of the state to the great importance of a record of vital statistics, and the last legislature had the good sense and sound judgment to enact a law which it is now believed will, when thoroughly understood, accomplish this work with approximate accuracy.

INDEX OF RECORDS.

The birth, marriage, and death records which are now in possession of this department, numbering many thousand names, were returned upon blanks not uniform in size, so that the whole constitutes a cumbrous mass of manuscript papers. Some of this material was turned over to this department by the secretary of state immediately after its organization, so that these records embrace a period extending back of the creation of the board. To find an individual name in these records requires the examination of a large mass of papers, and would consume considerable time. As these records are now increasing at the rate of about 20,000 names per year, it is evident that if in ten years from now it should become necessary to find when certain parties were born, married, or had died, and the time was not known within a few years, the task would be an exceedingly difficult and tedious one. Recognizing these difficulties, the secretary has commenced the work of indexing these returns by separate years. The index is being printed on a caligraph, and will be bound in volumes, each of which will embrace the record of a

year. The name sought will then be found in its alphabetical order, and even if several years have to be consulted it will require but a few minutes to do so. The original returns will be bound in volumes and dated, so that after the name has been found in the index the record can be verified by going to the certified and original returns, if thought necessary. The work of indexing and arranging this voluminous matter is a very great one. It is only by such a system that the records can be made available for ready reference and examination: especially will this be true after a lapse of several years. The originals, as soon as indexed, will be placed in a fire-proof vault, thus securing to the state records of inestimable value. It is believed that this work will be appreciated by all who have an interest in preserving not only everything that is of historical and genealogical importance, but data of many kinds that may serve to augment the welfare of the individual and the state.

TEACHERS' INSTITUTES.

The last legislature caused to be revived the teachers' institute, an institution which for several years has been dead. The work of establishing the same was commenced early in the past winter by Hon. J. W. Patterson, superintendent of public instruction, and was attended with most flattering results, as evidenced by the great interest manifested not only by teachers, but by the citizens in the towns and cities where held.

In addition to the studies hitherto taught in the institutes, that of physiology and hygiene was given a prominent place and ample time at each institute.

Among those secured to give instruction in these branches, were Professors Frost and Smith, of Dartmouth college, Dr. G. P. Conn, president of the State Board of Health, and the secretary. The subjects were taken up from the standpoints best calculated to give the teachers and the people the most information possible in the time allotted. Special attention was given to the subject of hygiene, particularly that portion which relates to ventilation and general cleanliness. The effects of stimulants and narcotics were also considered.

The result of this work has been to interest the teachers and the public in these branches, which are now by law embraced in

the curriculum of our common schools. It is believed that a great deal of information, by this means, has been diffused throughout the different counties on the important subject of hygiene. The value of these institutes cannot be computed, and it is hoped that in the interest of education they will be carefully fostered by the state.

SCHOOL-HOUSE HYGIENE.*

"Oh, sextant of the school-house, which sweeps
And dusts, or is supposed to, and makes fires,

* * * * *

O, sextant, there are 1 kermoddity
Worth more than gold, which doesn't cost nothink—
Worth more than anythink except the sole of mann :—
I mean pewer are, sextant ; I mean pewer are !
O, it is plenty out o'doors, so plenty it doant no
What on airth to do with itself, but flies about
Scatterin' leaves, and blowin' off men's hatts ;
In short, it's 'jest as free as are' out dores.
But O, sextant, in our school-house it's as scarce as hen teeth—

* * * * *

"U shet 100 girls and boys,
Speshaly the latter, up in a tite place—
Sum has bad breaths, none ain't 2 swete,
Sum is fevery, sum is scroflous, sum has bad teath, and sum ain't over
cleen :

But every 1 of 'em brethes in and out, & out & in,
Say 50 times a minit, or one million & a half breths an our ;
Now how long will a school-house full of are last at that rate,
I ask you? Say 15 minits, and then what's to be did ?
Why then they must brethe it all over agin,
And then agin, and so on till each has took it down
At least 10 times, and let it up agin. And wots more
The same individdible doan't have the privilege
Of breathin' his own air & no one's else ;
Each one must take whatever comes to him.
O, sextant, doan't you know our lunks is belluses,
To blo the fire of life and keep it from
Goin' out ; and how can bellusses blo without wind ?
And ain't wind Are? I put it to your consuns.

* Rev. M. W. Fairchild's version of the appeal of the people to the "Old Church Sextant." From the Report of the Michigan State Board of Health, 1882.

Are is the same to us as milk to babies,
 Or water is to fish, or pendlums to clox,
 Or roots and airbs unto a injun doctor,
 Or little pills unto a omepath,
 Or boys to girls. Are is for us to brethe.
 Wot signifies who teaches if I can't breathe?
 Wot's Profs. & Professes to children who are ded?
 Ded for want of breth! Why, sextant, when we dye,
 It's only coz we can't breathe no more—that's all.
 And now, O sextant, let me beg of you
 2 let a little are into our school-house.
 It ain't much trouble—only make a hoal,
 And all the are will cum of itself.
 It luv'es to cum in where it can git warm,
 And O how it would rouse the childers up,
 And sperit up the teacher, and stop gapes
 And yawns & fijjitts."

* * * * *

ICE.

Probably no popular error has been longer believed or more generally disseminated than the idea that water is deprived of its impurities by freezing. It is time that such a fallacy were thoroughly exploded. Ice may be as impure as polluted water, and often is. Some experiments have recently been made at the University of Michigan for the purpose of ascertaining the exact results that follow the freezing of impure water. Dr C. P. Pengra and Prof. V. C. Vaughan recently made some elaborate experiments in the laboratory of that institution, relative to the purification of water by freezing, and the results showed conclusively that freezing did not purify the water except to a very limited extent. The ice contained a little less infusoria and bacteria than the water before freezing; but they still existed in such large numbers as to render the water dangerous to use. These experiments only confirm the facts that have frequently been observed in actual experience. The epidemic that several years ago resulted from the use of impure ice at Rye Beach should not be forgotten; it was one of the forcible illustrations which this state has furnished upon the subject of ice contamination. The source from which ice is gathered should receive as much attention as the source of the water supply.

Ice from a stagnant pond of water is no more suitable for domestic purposes than the stagnant water itself; indeed, since ice has become so extensively a commercial article, and is transported long distances, as well as being furnished at the door like our groceries or milk, the question of its purity is one of no small magnitude. So few of the germs of disease are rendered innocuous by freezing, that ice might be a prolific medium for distributing these germs to the household. This idea is suggested for consideration, since it is positively proven that ice has, by reason of its impurities, produced sickness and death.

FILTH DISEASES.

To the sanitarian there is nothing so distinctly lamentable as the wholesale loss of life from preventable diseases. When the City of Columbus went down off Gay Head, with its cargo of human freight, a pang of horror went through every feeling soul; but more than five times as many in our own state alone annually go down into the cold earth from preventable causes, and the pulse of the state beats its even rhythm, and moves on undisturbed.

The grief spreads a pall over a thousand households: the hearts of the family circle are surcharged with sorrow almost to breaking, while the public eye is undimmed and unmoistened.

Preventable diseases thin our ranks daily, and we make little protest. Filth diseases, like blood-thirsty monsters, devour their innocent victims by the hundreds, and the few voices that have been raised in warning fall lighter upon the ears of every community than the senseless predictions of some cranky weather prophet. How long is it to be thus? How long shall these diseases invade the household? So long as the family vault is allowed to drain its foul contents, reeking with its vilest poisons, into the family well, and its volatile impurities load down the atmosphere of our dwellings with their death-dealing subtleties; so long as the sink-drain, more disgusting than the witches' cauldron, delivers its heterogeneous decoction into the sparkling water that is so sweet to adult and child, and its stealthy essence silently invades our living rooms by day and our sleeping apartments by night; so long as the family well is the pivotal centre, on the near periphery of which is the stable,

the barn-yard, the hog-pen, the hen-house, refuse heaps, and the decomposing waste of the household; so long as cellars are wet, unventilated, the walls covered with a mold that thrives only on dead and decaying products, tainted with decomposing filth of animal and vegetable life, like a forgotten tomb; so long as the gaseous products of these life-attacking forces rush into our houses at the swinging of every door by day, and are imprisoned there by closed windows at night, to invade our lungs, rush along every blood channel, and into every tissue, accompanied by our own dangerous eliminations of lung and skin; so long as undisturbed carpets, holding in perpetual embrace the impalpable dust of all these poisons, are ready to envelop the creeping child, and at each footfall spring up to attack the youth and the adult; so long as the food and the dairy products absorb the exhalations of unsanitary surroundings, and we eat them, unmindful of the results, and happy and innocent children quaff the polluted milk; so long as kind neighbors thoughtlessly visit those sick with contagious or infectious diseases, or allow their children to do the same; so long as public funerals are held over the remains of those who die of such diseases; so long as families shut their eyes and close their ears to these things, will cholera infantum, dysentery, diphtheria, and typhoid fever continue to reap a harvest of death, from the bright-eyed baby to the silver-haired old man, and the kind pastor, ignorant of this law of nature, will devoutly speak of these sins against physical life as the "dispensation of Divine Providence." For shame upon the ignorance that brands God as a murderer, when the crime rests upon human hands!

COMPLAINTS.

Many complaints have come to the board during the past year, and have been acted upon, which are not discussed in this report, for the reason that the details would be of no particular interest to any one.

Some cases possess more or less local interest, and by reason of the same are well understood by the little community which they affect. Hence no further publicity would subserve any good purpose. Again: the great number of cases, varying as they would in detail, which have received the consideration of

the board, would take up a large amount of valuable space, and thereby limit the amount of more valuable matter which it is intended a report of this nature shall contain. For these reasons, much of the executive work of the year is not given.

THE FIRST AND SECOND ANNUAL REPORTS.

The first and second annual reports of the board are now exhausted, with the exception of a few copies, which are held for exchange purposes. The demand for these works has very much exceeded the edition published. The large number of letters received from those who were fortunate enough to obtain the reports, commending the work, is a source of pride to the board, and gives an encouragement which, to say the least, is fully appreciated.

We have been pleased to acknowledge elsewhere the compliment of the last legislature in doubling the edition of the present and future reports.

THE LIBRARY.

The library of the board has been considerably increased during the past year. The additions have been secured almost wholly by gift or exchange. This library, which now numbers probably seven hundred volumes, will eventually be of inestimable value to the public, inasmuch as it is the property of the state, and not of the board. It is now open to the public in the same manner as the state library. The works which it contains relate largely to sanitary and medical matters, thus supplying a department of which the state library is deficient. Most of the volumes have been carefully indexed on the card system by topics, so that for ready reference of subject-matter it cannot be excelled. Contributions of sanitary and medical journals, health reports, etc., are respectfully solicited, and will be duly acknowledged.

PUBLIC AND CHARITABLE INSTITUTIONS.

ASYLUM FOR THE INSANE.

An official visit was made to the asylum for the insane by the board in April last. The entire buildings were inspected, and the condition in which they were found was highly gratifying. Improvements have been made in almost every direction in this institution, until it is now in a first-class sanitary condition. The greatest attention has been given to the securing of good ventilation and efficient heating of all the wards. The amount of space heated (not including the new wing, which is now nearly finished) is 1,059,766 cubic feet. Of this, 762,766 cubic feet of space is heated by indirect radiation, that is, by heated air which comes through flues in which there are steam coils. There are in this institution one hundred and sixteen air-flues, in which are steam coils. The buildings contain three hundred and ninety-one ventilating shafts, of the following dimensions :

206 ventilating flues,	.	.	.	.	.	.	12x12
71 " "	.	.	.	.	.	.	10x12
3 " "	.	.	.	.	.	.	24x24
6 " "	.	.	.	.	.	.	14x16
1 " "	.	.	.	.	.	.	12x24
6 " "	.	.	.	.	.	.	12x18
74 " "	.	.	.	.	.	.	8x12
8 " "	.	.	.	.	.	.	12x16
3 " "	.	.	.	.	.	.	16x20
1 " "	.	.	.	.	.	.	20x24
6 " "	.	.	.	.	.	.	16x18
1 " "	.	.	.	.	.	.	24x36

391 Total.

The heating is entirely by steam, and part of the cooking is also done by this means. The high pressure system is in use, the gauge registering, on an average, about fifty pounds per square inch during the winter months. This method is believed by the superintendent to be more expensive than the low pres-

sure system of heating. For all purposes, about one thousand tons of coal are annually consumed.

All the wards were scrupulously clean, and the atmosphere in those sections heated by indirect radiation was remarkably pure and sweet, while in those where direct radiation was in use the ventilation was very good, and an absence of the usual asylum odors was noticed.

The whole number of inmates during the year 1883 was 460; daily average number of patients for the year, 293.8. Of the whole number of patients, 25.9 per cent. were cured, or greatly relieved; 343, or about 78 per cent., were regarded as incurable. Nine incurables were sent to the county farms during the year, as follows: Rockingham two, Cheshire one, Strafford one, Coös one, Carroll two, and Hillsborough two.

Without going into an extended description of this institution, we feel that we can say that it is one of the best managed institutions of its kind in the country. The large number of assistants employed ensures all the attention required, and the evidences that the details requisite to the successful management of such an institution are not wanting can be seen by a visit to the asylum. The wards are so arranged that but few patients are brought together. The system of grouping is carefully carried out, and with very great advantages. In going through many of the wards, one would scarcely suspect the nature of the institution from observation alone. We believe the institution is well worthy the confidence that is bestowed upon it by the people of this and other states.

STATE PRISON.

But little need be said regarding this institution, and that in commendation of its condition and management. It would, indeed, show a great mistake somewhere if any serious charge could be brought against the sanitary appointments of a new institution like this.

At the time of the official inspection by the board, in April, there were one hundred and thirty-eight prisoners, of whom seventeen were from the District of Columbia, leaving one hundred and twenty-one to be credited to our state. The health of the inmates during the past year has been remarkably good.

There were, according to the report of the prison physician, Dr. H. M. French, six deaths during the year. These fatalities, he remarks, occurred among those serving long sentences, or who were committed in a broken-down condition of health.

Perfect cleanliness and good discipline are maintained, and the entire institution is a model of its kind.

COÖS COUNTY ALMSHOUSE.

This almshouse is still under the management of Mr. and Mrs. Hannaford, who have been there for many years. This fact alone, to those who are familiar with the institution, is a surety of efficient management and a fostering regard for the welfare of the inmates. The domestic affairs are well looked after.

This county, like some others in the state, was unfortunate from the first in taking an old farm-house, and building to it from time to time. Such a place never meets the requirements of a good almshouse.

The criticisms made in our last report regarding the drainage of these buildings would be again pointedly discussed, were it not for the fact that the present board of commissioners realize the importance of a change, and have already commenced improvements of a substantial character. The old sewer with its connections, which was a disgrace to the place, is to be taken up, remodelled, and put in a proper manner. A new laundry is now being built in a room directly over the boiler which supplies steam for the institution, and is to be ample in all respects. The insane department is to be improved and enlarged, and the bath rooms improved. The entire work contemplated will be a great improvement over the present condition, and a great comfort to the inmates, of whom there are between ninety and one hundred. The general appearance of the institution is good.

GRAFTON COUNTY ALMSHOUSE.

This institution was visited March 6, 1884, for the purpose of an official inspection. There were present at that time one hundred and thirty inmates, about thirty of whom were in the wards for the insane: this has been about the average number of inmates for the year. This institution will compare favorably

with the best in the state. With a few exceptions, which exist through a misconstruction of the buildings, the entire institution exhibited evidence of scrupulous care and neatness in the internal administration of its affairs. The main part of the almshouse is quite well ventilated, and almost entire absence of the usual almshouse odor was noticeable in this part of the buildings. This, perhaps, is not so much due to the system of ventilation, as to the efficient care of the personal condition of the inmates, and the general cleanliness of the rooms, by the matron. Although my visit was wholly unexpected, and was made early in the morning, yet I found everything in perfect order, which shows, in itself, the customary sanitary discipline of the institution.

There has been but very little sickness at this almshouse during the past year. I am informed that there never has been a case of typhoid fever, scarlatina, or measles in the institution, and no other zymotic disease except diphtheria, which occurred by bringing a family of six persons, who were already afflicted with it, to the institution. This family was quarantined in one of the upper rooms of the building, and strict attention was paid to ventilation and other hygienic conditions, so that the disease did not spread through the institution. This is quite a remarkable showing for an institution of this kind. The water supply is unexcelled by any similar institution in this state. Formerly, water was taken from a spring about two hundred feet higher than the buildings, upon a hill-side. This source of supply became rather low during some of the driest seasons, and during the past year the superintendent dug a well fifty feet higher than the spring, upon this same hill-side, and struck, in the bottom of the well, a copious spring: this he has connected with the other supply, and now there is an abundance of water for the institution. Two tanks of large capacity are placed in the attic of the buildings, and suitable provisions are made in case of fire. The most serious defect in the institution is the accommodations for the insane people; but this is to be remedied the coming summer. A system of ventilation is to be put in, which will at least render the atmosphere tolerable. At the present time there is no ventilation whatever. In addition to this, several other changes are to be made in the arrangement of these wards,

which will add greatly to the health as well as to the convenience of the place. These changes have already been decided upon, and will soon be carried out. Too much credit cannot be given to Mr. I. K. George, and to his wife, the efficient matron, for the interest and supervising care which they have shown during their connection with this institution. An examination of the reports of the county commissioners shows that the institution has made very great progress, in a financial direction, by reason of the increased productions of the farm, and a diminution in the expenses of carrying it on. This is to be classed as one of the best institutions of its kind in the state.

BELKNAP COUNTY ALMSHOUSE.

An official visit was made to this institution February 6, 1884, with the county physician, Dr. H. E. Mace, for the purpose of an annual inspection. It was mentioned in our report one year ago, that some urgent demands existed at this institution which should be provided for, and that there were some defects which should be remedied. To a certain extent these improvements have been made; however, there is ample room yet for further improvement. The construction of the buildings themselves, which were erected several years ago, is faulty in several respects.

First. The question of properly classifying the inmates was, probably, not taken into consideration, consequently the house is badly arranged for any classification or separation of the sexes.

Second. Suitable provision was not made for ventilation. These are the principal evils which existed in the construction of the buildings, but the latter has been considerably obviated by the construction of several ventilating flues. These, to a limited extent, answer the purpose for which they were designed.

Ventilating flues which are operated at the will and pleasure of the inmates, who have no knowledge of the importance of good ventilation, cannot accomplish all that is required or designed, for the reason that in order to save a little heat, and maintain the rooms at a higher temperature, the flues are nearly always closed. In an institution of this kind no part of its system should be under the control of the inmates; especially is

this true as regards heat and ventilation. However, these ventilating flues have accomplished a great deal of good, and have secured much better ventilation than would have existed without them.

The new boiler, which was mentioned in our last report, has secured for the institution all that is desired in this direction. There are a sufficient number of radiators to amply warm the entire buildings, and the increased capacity has proven highly economical to the institution. The water supply of the institution is now ample, one large tank having been added during the last year, so that now there are three tanks of a capacity of from thirty to forty barrels each. The water, it should be remembered, is pumped to these tanks by wind-power, from the adjacent bay, and the experience of the past summer has proven that this method can be fully relied upon. It was thought, before the trial was made, that this power would not be sufficient during some parts of the summer season, when there was very little wind; but the experience of the past summer has proven that it is ample in every respect. Additional hydrants, with an abundance of hose constantly connected, have been placed at convenient points in the main building, so that the protection from fire is very much increased. Unless the fire occurred in the attic, or had gotten under great headway before discovered, the provisions mentioned would no doubt be sufficient for the occasion.

The general appearance of the whole institution is excellent; unusual cleanliness prevailed in every department, and it was especially noticeable in the persons of the inmates themselves. A casual observation would convince any one that the internal administration of the institution is beyond criticism. The total number of inmates at the time of my visit was sixty-two.

The system of drainage is not what it should be. The suggestions that this board has formerly made have not been carried out in full. It is essential that some further attention be given to the subject of properly sewerage the establishment. The cost of doing this in a substantial and correct manner would be but very little. While the general health of the inmates has been excellent, and the institution free from zymotic diseases during the past year, it should be remembered that upon the occurrence of such, sanitary defects always add fuel to the flames.

The jail, which adjoins the other buildings, is, in its present condition, a disgrace to civilization. It is a stone structure, without any ventilation whatever. The lower story is occupied by prisoners, and the upper story by insane persons. At the time of my visit the jail was full, and the department for the insane had an ample population. The condition of the atmosphere in both is simply intolerable, there being no methods whatever of ventilating either department, except by opening a window, which in the winter-time of course cannot be done without danger to the health of the inmates. In the present condition, the whole structure is absolutely unfit for the detention of any person, and it should not be allowed to longer exist, when, with a very little expense, suitable ventilation could be secured. It is not to be expected that a jail will have all the modern conveniences and luxuries of civilization, but it is incumbent upon the proper authorities that such persons should not be deprived of pure air, good water, and wholesome food. No charge is made against the two latter mentioned, in this institution, as both the food and water are excellent in quality. While this institution exhibits evidences of constant improvement, by alterations and additions that are being made from year to year, it is suggested that the important subject last mentioned should receive immediate consideration by the commissioners of the county. The people of the county seem to take considerable pride in securing for this institution all the necessary improvements that are warranted in such a public charity, and the result of such interest is manifest in the general excellence of the whole institution, and there is no doubt but that its existing evils, which are comparatively few, will in a reasonable time be provided for. The institution is still under the efficient management of Mr. Rufus Clark and wife.

OTHER INSTITUTIONS

Have been visited, and buildings inspected during the year, among which may be mentioned several school-houses in process of building, or undergoing repairs or alterations. Reports upon some of the state institutions and county almshouses now undergoing changes will be given in our next report, as at the present time such report would necessarily be incomplete. Among

the improvements which have been made in our public buildings, none are greater than the work authorized by the last legislature to be done in the basement of the state-house. The sanitary conditions had become a disgrace to any building, and we believe the next legislature will appreciate the great improvements that have been made.

The growing interest in school-house improvements, as regards heating, ventilation, water-supply, and proper sanitary conveniences have been observed with much satisfaction. The thinking public are beginning to see that "an ounce of prevention is worth a pound of cure," and to recognize the fact that a little attention to some of the plainest laws of our existence will ward off much sickness. Want of space prevents us from giving many interesting details of this kind of work which has been done within the state during the past year.

SEWERAGE OF THE CITY OF KEENE.

The following brief description of the sewerage of Keene was published in the *American Architect*, by L. M. Muzzey, engineer in charge, and is here given by his permission.

The present population of the city of Keene is about eight thousand. Water-works were introduced in the year 1869, although Keene was not incorporated as a city until 1874.

The necessity of sewerage became soon apparent, and action was taken by the city council in the year 1876 in reference to providing a proper system of sewers for the city. Phineas Ball, of Worcester, was employed to submit recommendations, and his careful and elaborate report was published by the city council in 1876. It may be well to quote a few figures from this report. Mr. Ball's system provides for the drainage of 1,718 acres, and the following are the total lengths of the various sizes of sewers recommended by him:

550 feet 40 in. x 60 in. brick sewer;				739 feet 32 in. x 48 in. brick sewer.			
1,754	"	30	x 45	"	2,372	"	24 x 36
1,012	"	22	x 33	"	8,075	"	16 x 24
16,000	"	15	pipe sewer;	"	19,278	"	12 pipe sewer.

The cost of this system, although not estimated in the report, would not be far from \$150,000. It is evident that the considerations which led to the choice of so large sewers in this system were the admission of storm-water, and the slight variations in level, which obtain over a large portion of the city.

Further action in the matter of sewerage was suspended until the year 1882, when the city council employed Col. George E. Waring, Jr., to devise a system of sewerage similar to that designed by him and now in successful operation in the city of Memphis, Tenn. Col. Waring submitted a plan which provided for the drainage of substantially the same area as that included within the plan of Phineas Ball. In the specification accompanying his plan he states: "The system is arranged for the exclusion of all street, yard, roof, and other surface and rain water, and is intended to carry all waste water discharged from dwelling-houses, manufacturing establishments, etc., and the overflow of all fountains supplied from the city water-works. The system is to be completely flushed at intervals of not more than twenty-four hours, from flush-tanks having a discharging capacity of from one hundred and forty to one hundred and fifty gallons; one of the flush-tanks being located at the head of every branch of the sewers, and connected with the water supply, so that it will be filled to the discharging level at intervals not greater than twenty-four hours, with appliances for reducing the intervals, at the option of the city, to six hours. All connecting pipes or drains between the sewers and houses, shops, etc., to be restricted absolutely to a diameter of four inches, and to be laid without a trap, obstruction, or contraction, so that their extension through the soil or waste pipe of the house may afford a free channel for ventilation to the open air."

WARING SYSTEM ADOPTED.

The city council of the city of Keene passed the following resolution August 21, 1882: "*Resolved*, That the plan for sewerage submitted by Col. George E. Waring, Jr., be adopted, and a joint special committee on sewerage be appointed and authorized to make a contract with the Drainage Construction Company, of Boston, or such other parties as they may think best, for laying sewers in various streets as shown on the plan, and in accordance with the specifications submitted by Col. George E. Waring, Jr., and that the sum of \$85,000 be raised and appropriated therefor." The plan called for the construction of the following lengths and size of sewers:

8,800 feet of 15 in. sewer,	1,950 feet of 12 in. sewer,
1,240 " 10 "	580 " 8 "
60,520 " 6 "	all being pipe sewers.

In view of the large territory in which sewerage had become an urgent

necessity, and in view of the enormous cost at which even a limited system could be constructed on the plan recommended by Phineas Ball, it seemed to most of the citizens of Keene that the system as devised by Col. Waring was the best that could be obtained for an efficient and economical drainage of the city. The level condition of the surface of the basin in which a large amount of sewerage was demanded was a difficulty which any system must contend with in securing adequate grades for the sewers, and to meet this it was thought that by excluding all storm-water from the sewers, and allowing only sewage matter to flow through them, the frequent cleansing which the flush-tanks must give to the pipes would be amply sufficient to overcome this natural objection.

THE SYSTEM.

The surface formation in the city of Keene, embraced within the limits for which sewerage is provided, is such as to naturally divide it into two distinct districts, with separate outfalls for the sewers into the Ashuelot river, about three fourths of a mile from the centre of the city. The districts are designated as the Central and Beaver Brook districts, the former embracing the central and western portions of the city, the latter the eastern section. A considerable portion of the central system is situated on nearly level land, whose elevation does not vary largely from heights of eight and ten feet above the water in the Ashuelot river. North of this level section the land rises gradually until an elevation of sixty feet above the river is attained. The Beaver Brook district is divided nearly in twain by the brook bearing that name, the land sloping upward on either side. The highest elevation of this brook within the sewerage limits is about eleven feet above the Ashuelot river, into which it empties. The location of the main sewers was, therefore, easily determined,—the one to follow the general direction of the brook, the other to start from the Central square and run in a south-westerly direction to the river.

The grade of the 15-inch central main from its outlet in Butler's Court to the Square is, on the average, about 1 foot in 310 feet. Most of the laterals connecting with the main have grades of over 1 foot in 250, excepting four or five short lines whose grades are generally 1 in 400. The largest grade, however, which could be obtained for the Beaver Brook main was one foot in eight hundred feet; the least for a few hundred feet from the outlet was 1 foot in 1,000 feet. The laterals to this main also have good grades, only a few lines having a grade of 1 foot in 400.

The plan which Col. Waring suggested for overcoming high water in the Ashuelot river (which during any period of heavy rain or thaw often rises from three to six feet above the outlets of the sewers), was to have a jet-pump near each outlet, worked from the city water-supply. Whether this will be adequate to secure the desired result can be determined only

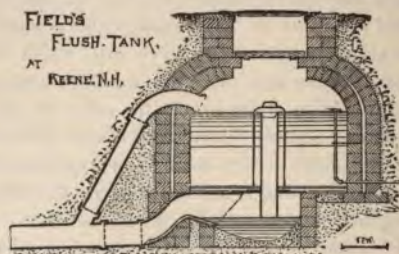
by a few years' experience, as no opportunity to test it has as yet been afforded.

CONSTRUCTION.

Material. All of the sewers are of the best quality of vitrified pipe, of sizes varying from six to fifteen inches in diameter. The pipe was subjected to rigid inspection, once in the yard and finally at the trench, before laying. The requirements of the inspection were, that they must be free from cracks (slight checks in burning excepted), that they should be perfectly smooth on the inside, straight, and of uniform diameter. The kinds of pipe used were the Boynton pipe (6-inch), of New Jersey, Akron pipe, Portland pipe, English and Scotch pipes. The following are about the per-centage accepted of the different kinds: Boynton, 70 per cent., Akron, 80 per cent., Portland, 85 per cent., English and Scotch, 75 per cent.

Cement. Most of the cement used was the Hoffman brand of Rosendale cement. Every barrel was tested by what is known as the "ring test," samples being taken from each barrel, mixed into a stiff paste, and allowed to set under water. Samples were accepted if they supported without impression a quarter-pound weight, on a wire one twelfth inch in diameter, within one half hour of mixing, and all were rejected which failed to support a pound weight on a one twenty-fourth inch wire, twelve hours after mixing. About five hundred barrels were tested, of which about ten per cent. was rejected.

Man-holes. In Col. Waring's plan only twelve man-holes were provided for the entire system,—six on the Beaver Brook main, and six on



the central main. We, however, deemed it advisable to increase the number, and man-holes were built at frequent intervals on the main, and at junctions of pipes where they seemed to us necessary. The invert in the man-holes were formed of half-pipes bedded around and underneath with concrete.

Flush-tanks. The flush tanks were built with a uniform capacity of about one hundred and fifty gallons. The accompanying diagram shows the form in which they were constructed in Keene. On account of the

severity of the climate it was deemed expedient to have a double brick wall with air-space between. Several tanks were in operation the past winter, and were not affected by the frost, which was several feet deep.

Access to the Sewers. Two-foot pipes, with loose covers over openings extending about fifteen inches on the top of the pipes (forming hand-holes), furnish the means for access to the six-inch sewers, and are placed at intervals of one hundred feet on the sewer-line. Once in every three hundred feet these are replaced by stand-pipes or lamp-holes, with the vertical six-inch pipe reaching to within two feet of the surface of the ground. In this manner the flow of the current can be observed every three hundred feet, with little difficulty. Wherever curves occurred in the line, "hand-holes" were placed at each end of the curve to afford greater facility in removing any obstruction that might be lodged there.

Trenching. Many varieties of soil have been encountered in laying the sewers in different portions of the city. In the highest streets the digging was almost wholly in sand, with no water, and sufficiently compact in many places to require little or no bracing of the trench. Throughout the central part of the city more or less quicksand was found, at depths below six feet. It occurred in three forms: first, as a blue, clayey quicksand; second, like ordinary fine sand readily running in water; and third, as a swampy sand with some mud intermixed. The first was by far the most troublesome, as when softened with water the entire bottom of the trench became yielding and uncertain. Close sheet-piling was used, and a good foundation for the pipe secured by sinking plank scows into the quicksand until a firm bottom was reached. A good method of laying pipe in this kind of trench was to use a square trough, wide enough to receive the pipe, which could thus be laid free of running sand around the joints. Ordinary brick-clay has occurred in many places, in which, if softened by water, plank foundations were laid.

Pipe-laying. To prevent the entrance of cement into the pipes at the joints, a band of twisted oakum was pressed between the bell and spigot of the pipes. It was found inadvisable to put cement in the bottom of the bell of the pipe before inserting the spigots. All sizes of pipes were laid on a true grade by the use of the grade-line and rod. Stubs were driven alongside the trench, fifty feet or less apart, to nearly the surface of the ground, and the distance of the flow-line of the sewer below these given at each station.

Tile Drainage. As this system excludes all surface or storm water, a special care was taken to provide an efficient drainage of the soil by means of drain-tiles. The form of tile most used was round, nearly non-porous, in lengths of two feet, and of sizes varying from one and one fourth inch to three inches. They were laid alongside the sewer-pipe, and at nearly the same grade, the joints being securely wrapped with muslin torn into strips three inches wide, and long enough to go twice around

the pipe. Frequent outlet was given them into the sewer by means of running the tile into a pipe, or entering it at a man-hole.

SEWERS COMPLETED.

The following statement shows the total amount of sewerage constructed in Keene under the contract of the Drainage Construction Company:

9,665.55 feet of 15-in. pipe sewer;	3,441 feet of 12-in. pipe sewer.
1,178.5 " 10-in. "	2,742.5 " 8 " "
44,788.5 " 6-in. "	

Forty-four flush-tanks and fifty-one man-holes have been built. The contract prices per foot of laying the above sizes—all material furnished by the contractors, and work done in accordance with the specifications—are as follows:

For 15-in. pipe, \$2.05 per foot.	For each flush-tank completed, \$63.00
" 12-in. " 1.61 "	" " man-hole " 40.00
" 10-in. " 1.34 "	" " outlet " 200.00
" 8-in. " 1.06 "	" " inlet " 100.00
" 6-in. " 0.90 "	

The following additions and deductions were made from the original plan: 265.5 feet 15-inch sewer added; 1,491 feet 12-inch sewer added; 2,212.5 feet 8-inch sewer added; 61.5 feet 10-inch sewer deducted; 15,731 feet 6-inch sewer deducted; 39 man-holes added, and 14 flush-tanks deducted.

The number of families to whom sewerage is now accessible in Keene is seven hundred and twenty. It is also accessible to seven manufactories and three hotels. All the sewers in the city have been thoroughly tested by passing wooden balls through the pipes. These balls were two inches less in diameter than the pipes, and were driven through them by a stream of water from the city water-works. The system is now in satisfactory working order, and connections are being rapidly made by the citizens.

The system described in the foregoing paper was completed early in the year 1883, and has now been subjected to nearly a year's trial, including one winter, and has fulfilled the expectations of the most sanguine. It was thought by many that these sewers would be a failure in part, if not totally, for the reason that so little fall could be secured, and the fact that the high water in the Ashuelot would flow back for more than a half mile in the main sewers.

The specifications given by Col. Waring contemplated jet-pumps near the mouths of the main sewers, to which could be attached a hose from the city hydrants so as to create a current

in the sewers when the same were filled with water from the river, but it has been found by the experience of the past spring that this will be unnecessary. During the season of high water a careful examination was made by opening some of the man-holes near the river, in which it was found that the water stood seven or eight feet in depth, and that a good current was being maintained. A board of scantling, put down through this depth of water, was immediately carried along to the lower side of the man-hole with considerable force, showing that notwithstanding the fact that the high water flowed back more than half a mile in these branches, a good current was constantly maintained, so that the sewers were not obstructed at any point by reason of flowage. No sewers could be put to a severer test than have these, so far as high water is concerned.

The only repairs necessary have been after frost came out of the ground in the spring, upon one or two flushing-tanks, which, after being made, were filled around with loam instead of gravel or sand, by which the frost lifted the tops of the flushing-tanks, thereby doing some little damage to one or two of them. This entire system, prior to and during its construction, met with a great deal of opposition from many of the citizens of Keene. That this opposition was based upon an honest opinion in the matter there can be no doubt, for to most people, notwithstanding the science of engineering and sewerage, it would seem impossible that such excellent results could have been secured. The practical demonstration of the utility and perfect working of these sewers has almost entirely removed this feeling.

To complete in a perfect manner the work which was so well projected, the city has passed an ordinance requiring all persons who connect with the sewer to obtain a permit which specifies the exact manner in which the connection shall be made and the plumbing done. All branches to buildings must terminate in the open air above the roof of the house. Glazed pipe is allowed to be laid to within five feet of a building, the remaining portion of the branch to be of iron. Every trap must be ventilated, either into the soil pipe or the open air above the roof, and all joints must be air-tight. It is only by carrying out a correct system of plumbing that the sewers can be wholly robbed of their danger to the household.

The city of Keene is to be congratulated upon the splendid system of sewers which it possesses to-day, and the efficient manner in which all connections are being made. It is safe to say that no city in New England, or in this country, has to-day a better or more perfect system of sewerage than Keene.

A BRIEF SUMMARY OF THE REGISTRATION REPORT OF 1883.

BIRTHS.

The registration report for the year ending March 31, 1883, which will be published during the year, shows a return of a larger number of births than has heretofore been reported in the state in a single year. There were reported in 1880, 4,249; in 1881, 4,615; in 1882, 6,124; and in 1883, 6,150. It will be seen by these figures that there was but a small increase over last year's report, which verifies the assertion formerly made, that the law under which these returns were obtained would never secure an accurate registration. No efforts have been spared to secure a correct record, yet the failure to do so is evident when these figures are compared with the average percentage in those states which have, approximately, a correct registration. Based upon such calculations, at least 1,500 births remain unreported. It is expected that the law which came into force on January 1 of the present year will secure much better results. It is difficult, if not impossible, to secure an accurate record of births under any system that is in use, yet a comparatively correct record has been obtained under a law similar to that now in force in this state.

The following table exhibits the number reported from each county, with sex, and also the excess of males over the females, which is comparatively uniform in all states and countries. Although deficient as to the total, the ratios are undoubtedly nearly or quite correct:

TABLE 1.

BIRTHS BY COUNTIES, SHOWING PROPORTION OF MALES TO FEMALES,
1883.

Counties.	Males.	Females.	Excess of males.	Excess of females.	Sex not stated.
Rockingham.....	335	353	.....	18	4
Strafford.....	343	350	.....	7	5
Belknap.....	125	136	.....	11	.....
Carroll.....	144	131	13	.....	11
Merrimack.....	371	347	24	.....	5
Hillsborough ..	60	776	84	.....	39
Cheshire.....	250	242	8	.....	4
Sullivan.....	139	126	13	.....	4
Grafton.....	331	309	22	.....	7
Cods.....	210	190	20	.....	3
Total for state.....	3,108	2,960	148	.....	82

Table 2 shows the percentage of American and foreign births, so far as the same are given. It is quite probable that nineteen twentieths, at least, of those reported in the column of "parentage not reported," are of foreign origin.

Of the 6,150 births reported, the parentage is represented as follows: American, 3,312; foreign, 1,430; one parent foreign, 549; parentage not stated, 359.

TABLE 2.

PERCENTAGE OF AMERICAN AND FOREIGN BIRTHS, BY COUNTIES
1883.

Counties.	PARENTS.			Births with percentage not report- ed.
	American born.	Foreign born.	One foreign born.	
Rockingham.....	75.00	9.97	7.80	50
Strafford.....	50.14	30.80	10.45	60
Belknap.....	67.81	16.85	9.50	15
Carroll.....	75.17	11.18	4.89	25
Merrimack.....	68.48	19.91	8.99	54
Hillsborough.....	31.22	36.00	7.40	421
Cheshire.....	65.52	17.13	7.05	51
Sullivan.....	66.17	12.63	8.91	33
Grafton.....	63.52	14.06	12.05	67
Cooks.....	38.70	26.55	14.14	83
Total.....	53.85	23.25	8.92	859

Twin births were reported, as follows :

TABLE 3.

TWIN BIRTHS BY MONTHS AND COUNTIES.

COUNTIES.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Colored Children.	
														M	F
Rockingham .....	.....	.....	1	1	.....	1	.....	.....	.....	.....	.....	1	4	.....	.....
Strafford.....	1	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	3	.....	.....
Belknap.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	2
Carroll.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	.....	.....
Merrimack.....	1	1	.....	1	.....	.....	.....	.....	.....	1	1	.....	5	1	1
Hillsborough....	1	1	2	2	.....	1	1	1	1	1	3	1	15	1	.....
Cheshire .....	.....	.....	2	.....	1	2	.....	1	1	.....	.....	.....	7	.....	.....
Sullivan.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....
Grafton.....	.....	.....	.....	1	.....	.....	1	.....	.....	.....	.....	.....	2	.....	.....
Cooks.....	.....	.....	1	.....	2	.....	.....	.....	.....	.....	.....	.....	3	.....	.....
Total for state.	3	2	6	5	4	5	3	2	2	3	5	2	42	2	3

Five colored births only were reported.

MARRIAGES.

This state undoubtedly secures as accurate a registration of marriages as any in the country. As remarked in a former report, this is largely due to the promptness of the clergy in complying with the requirements of the law. Another important factor in securing correctness is the town-clerk's record of certificates issued, by which he is enabled to ascertain who the delinquents are, and thus has it in his power to reach them and secure the necessary record. Very few clergymen are negligent in this respect: most of the delinquents are to be found among the justices of the peace, who not infrequently perform this ceremony. Three thousand two hundred and forty-six marriages were reported during the year. Table 1 shows the nationality of each, by counties.

TABLE 1.

COUNTIES.	Both American.	Both Foreign.	Husband American.	Wife American.	Not stated.	Total.
Rockingham.....	300	25	12	10	52	399
Strafford.....	303	53	20	14	35	425
Belknap.....	140	22	12	6	18	198
Carroll.....	135	5	3	4	28	175
Merrimack.....	297	38	27	17	53	432
Hillsborough.....	468	253	77	39	112	949
Cheshire.....	195	13	8	14	32	262
Sullivan.....	188	1	3	4	21	167
Grafton.....	250	13	11	25	40	339
Cochs.....	86	18	15	13	17	149
Total.....	2312	441	188	146	408	3495

The following table shows some of the interesting features in the marriage returns which have been forwarded to this office :

TABLE 2.

COUNTIES.	Instances in which the age of the bride exceeded that of the groom.		Widowers.		Widows.	Third marriage.		Fourth marriage.		Fifth Marriage.		Seventh marriage.		Oldest.		Youngest.		Oldest couple.		Youngest couple.	
						M	F	M	F	M	F	M	F	M	F	M	F	M	F		
Rockingham.....	50	64	48	9	9	..	..	..	..	78	70	18	14	78	70	21	15				
Strafford.....	81	68	60	10	2	..	..	..	..	78	63	18	15	78	55	19	15				
Belknap.....	34	33	25	5	1	1	..	..	..	72	72	18	14	72	72	18	18				
Carroll.....	26	35	18	2	2	..	..	..	..	66	60	17	14	59	68	19	14				
Merrimack.....	73	77	45	9	2	3	..	..	..	74	66	16	14	72	65	16	16				
Hillsborough.....	136	154	99	11	13	4	..	..	..	79	71	17	15	77	71	17	16				
Cheshire.....	36	35	20	8	3	..	..	..	..	78	70	18	14	71	70	19	16				
Sullivan.....	22	32	19	4	3	..	..	..	..	74	62	18	15	74	51	18	17				
Grafton.....	41	56	44	8	8	1	..	..	1	76	69	19	15	75	69	19	16				
Cooks.....	14	18	13	3	..	1	..	1	..	63	58	19	15	63	58	19	16				
Total for state.....	513	572	391	69	43	10	..	1	1	79	72	16	14	78	70	16	16				

DIVORCES.

The following table was prepared by Hon. A. B. Thompson, secretary of state, as required by the Pamphlet Laws of 1881 :

TABLE 1.

DIVORCES DECREED BY THE SUPREME COURT OF NEW HAMPSHIRE IN THE YEAR 1883, AS RETURNED TO THE SECRETARY OF STATE BY THE CLERKS OF THE SEVERAL COUNTIES.

Counties.	Causes of divorces.								Libellants.		
	Abandonment.	Adultery.	Absent three years	Conviction of crime and imprisonment.	Extreme cruelty.	Habitual drunkenness	Impotency.	Treatment injurious to health.	Males.	Females.	Totals.
Rockingham.....	7	5	.....	1	4	4	.....	.....	8	13	21
Strafford.....	9	15	9	.....	14	6	.....	.....	30	23	53
Belknap.....	.....	6	2	.....	7	1	.....	.....	4	11	15
Carroll.....	2	2	.....	1	1	1	.....	.....	2	5	7
Merrimack.....	17	8	.....	.....	18	4	1	1	18	31	49
Hillsborough.....	24	14	.....	.....	32	4	.....	.....	24	50	74
Cheshire.....	8	7	.....	.....	9	1	.....	.....	7	18	25
Sullivan.....	4	6	.....	.....	2	.....	.....	.....	4	8	12
Grafton.....	7	4	.....	.....	2	1	.....	.....	6	8	14
Cochs.....	.....	1	1	.....	1	.....	.....	.....	1	2	3
Totals.....	78	68	11	2	90	22	1	1	104	169	273

The following was compiled by the secretary from certified returns received from the various county clerks. It is presented as a basis of study for those who are interested in the subject.

TABLE 2.

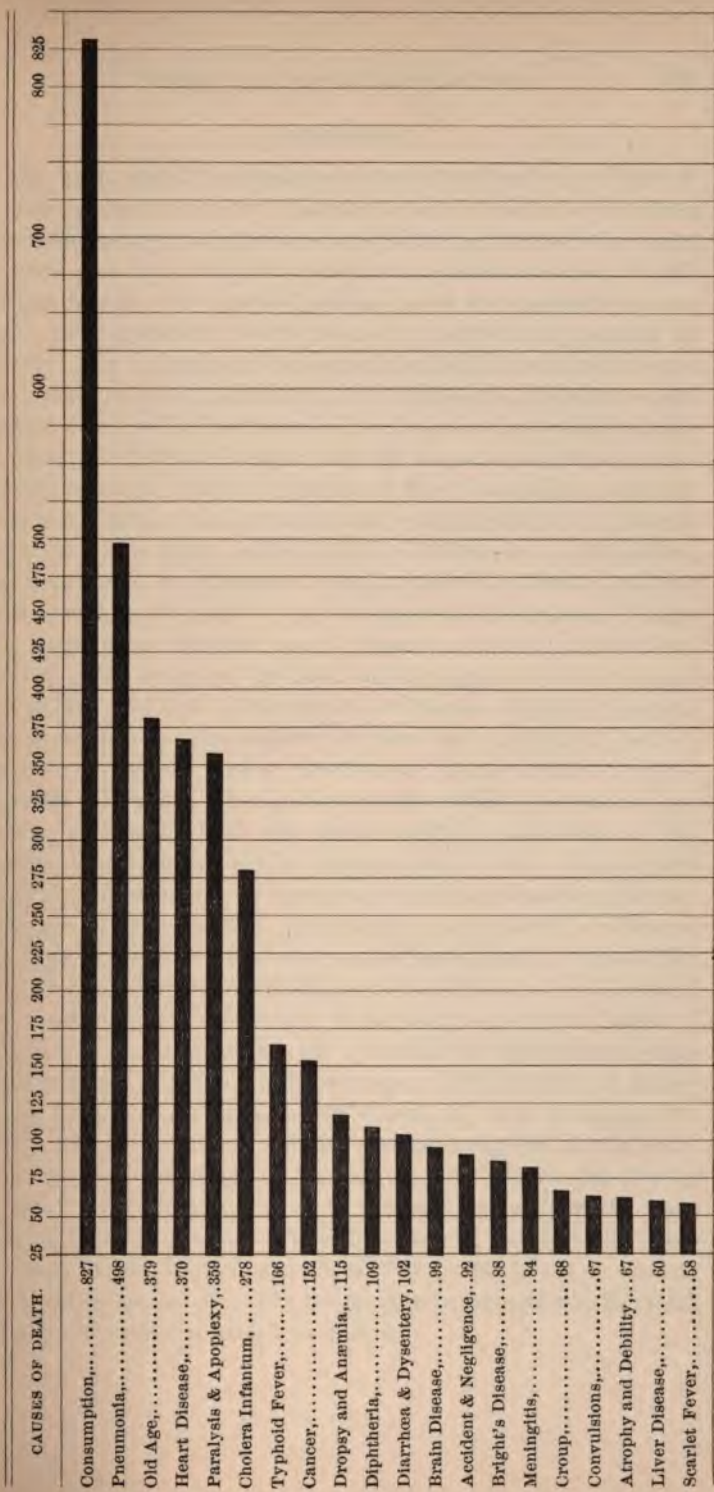
DIVORCES DECREED FROM 1870 TO 1883 INCLUSIVE, BY COUNTIES.

Counties.	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883
Rockingham.....	19	20	29	34	41	23	37	18	30	30	44	30	23	21
Strafford.....	12	6	24	27	25	17	20	29	29	34	58	42	36	53
Belknap.....	....	7	7	13	12	10	18	16	16	16	22	17	14	15
Carroll.....	4	1	1	9	9	4	10	13	19	13	11	19	9	7
Merrimack.....	15	27	32	13	51	37	40	23	22	36	41	25	49	49
Hillsborough.....	64	37	58	51	77	75	65	73	61	69	83	87	90	74
Cheshire.....	12	19	19	16	15	22	21	17	18	22	31	21	34	25
Sullivan.....	6	6	10	16	17	13	26	9	10	8	9	22	17	12
Grafton.....	13	21	15	29	22	20	20	29	17	27	25	37	27	14
Coös.....	4	5	2	4	12	11	9	10	11	10	15	7	15	3
	149	139	197	212	281	232	266	237	233	265	309	307	314	273

DEATHS.

There were reported to this department, for the year ending March 31, 1883, 5421 deaths—420 more than were secured for the previous year. This gives a rate of 15.62 to each 1000 of the population, based upon the census of 1880. These results give encouragement that we shall soon possess in this state a registration record approximating accuracy. The present law will doubtless obviate the defects that existed under the former law, and bring the state a record that will be exceedingly valuable as a basis of study upon important subjects connected with the health and welfare of the people of the state. Indeed, the present results are of great value in studying the diseases that prevail throughout the state. The ratio that one disease bears to another, in point of numbers, is not probably affected to any extent by the incompleteness of the record in total numbers. The following diagram illustrates, in a vivid way, the ratio existing in the fatality of twenty of the most fatal diseases reported :

DIAGRAM I. SHOWING THE COMPARATIVE MORTALITY, BY ABSOLUTE NUMBER OF DECEDENTS, FROM TWENTY PROMINENT CAUSES OF DEATH, DURING THE YEAR ENDING MARCH 31, 1883.



CONSUMPTION.

The long, black line which stands at the head, is in itself a terrible commentary upon a silent foe which insidiously invades every community, and gathers its victims largely from the ranks of those who have not yet reached the meridian of life. If 827 human beings were annually killed upon the railroads of our state, the legislature would promptly prohibit the running of trains. If a contagious disease were annually imported into the state that swept from existence 827 living souls, the state would protect every rod of her frontier by a cordon that would require an army of 10,000 able men, and the expense would be of secondary account. If 827 citizens of New Hampshire were annually carried to eternity through an epidemic that did its fearful work in a few days, panics and demoralization would follow, business would be stagnated, and a general exodus from the state would be the result. But the spectacle is different. These 827 souls drop into the sea of eternity as silently as the leaf falls upon the bosom of the lake, and the ripples made reach not the public, and fall lighter upon the friends because expected. But these deaths—the majority of them—in the light of modern study and research, are as needless as deaths from other preventable diseases. The opinion is entertained by eminent physicians and sanitarians, who have carefully considered all the factors that bear upon this disease, that it may be to a very large extent avoided. Without any hereditary tendency, the occurrence of consumption must be from a violation of some of the laws of physical life for which the individual is responsible. With a hereditary family tendency to this disease, the individual has a warning that should lead to the adoption of such habits of life as will tend to maintain the system in the best possible state of existence. To this end it becomes a duty, not only of physicians, but of the public, to consider seriously this alarming subject. The proportion of deaths from consumption in this state corresponds very nearly to that of all the Eastern and Middle states. Over fifteen per cent. of the total mortality of the state is from this one disease. The difference in the mortality rates between the country and the cities of our state is not so marked as might be supposed. The percentage in our cities to the total number of deaths in each is as follows :

Manchester, ...	14.89
Concord, ...	11.41
Nashua, ...	16.96
Dover, ...	20.97
Portsmouth, ...	16.02
Keene, ...	16.91

This would make an average of 16.19 per cent. for the cities of our state. Out of the total deaths from this disease, 35 were under 10 years of age; 24 between 10 and 15; 79 between 15 and 20; 113 between 20 and 25; 112 between 25 and 30; 69 between 30 and 35; 67 between 35 and 40; 88 between 40 and 50; 62 between 50 and 60; 70 between 60 and 70; 64 between 70 and 80; 19 over 80, and 25 with age not stated. It will be seen that the mortality is much the greatest between the ages of 20 and 30. March was the most fatal month of the year, and June the least so.

Of the nationality of the decedents, 593 were American born, 134 foreign born, and 100 nationality not stated. It is fair to assume that at least 75 per cent. of the latter should be classed as foreign born. Under such a classification we would have American born 618, foreign born 209. The census of 1880 shows in this state 300,697 native born, and 46,294 foreign born persons. This would show, under the classification just given, a mortality of 2.5 per 1000 among the native born, against 4.5 per 1000 among the foreign born, from this disease. When it is remembered that every child born on American soil is classed as native born, no matter if the parents have just arrived from sunny Italy, or elsewhere, it is evident that the actual mortality among the foreign element is still larger than is represented in the percentages given.

The excess of female decedents over males presents another important phase in the study of this disease, and strongly confirms much that has been written on the preventable aspect of consumption—502 females and 325 males.

These stern and terrible facts are given, in the briefest manner, for reflection and study. The lessons they unfold to the thinking mind are many and sad.

PNEUMONIA.

To this disease 498 persons succumbed during the year embraced in this report. This is a disease largely of childhood and old age, the greatest immunity usually being between the ages of five and twenty. The greatest fatality is among those under five years and those over fifty years of age.

The winter and spring months, which embrace inclement seasons of the year, are much more prolific in deaths from pneumonia than any other period of the year.

Many of these cases doubtless follow a cold, taking the form of broncho-pneumonia, and result from inattention and carelessness, when a proper regard and care for one's self, in the earlier stages, would have prevented serious consequences. A due precaution against sudden changes of temperature, with good hygienic surroundings, would undoubtedly reduce very greatly the number of deaths that annually occur from this disease.

TYPHOID FEVER.

The report of last year showed 214 deaths from typhoid fever. The present report, though embracing 420 more deaths than the last, shows only 166 deaths from this disease. Supposing the mortality rates to have been the same as last year, there would have been 231 deaths from typhoid, showing a diminished death rate which amounts to the saving of sixty-five lives from this disease alone. To what extent the sanitary work which has been done during the year has contributed to decrease this disease it is not possible to demonstrate, but it is not unreasonable to presume that it has saved many valuable lives. Just in proportion to the amount of such work done will typhoid diminish. This has been repeatedly proven by sanitary improvements in several cities and towns in England, and has been corroborated by similar work in this country. Sporadic and non-epidemic cases must have their origin in local causes. There are times, as in epidemics, when probably other forces than purely local conditions exert an influence which adds numerically and malignantly to this disease. What this force or condition is which fans the smouldering fires of disease into a wide-spread conflagration, without any apparent change in environments, is a

question *sub judice*. It is believed, however, that without certain local conditions, this unknown factor would be inert; hence local causes are primary.

Neither age nor sex is exempt from this disease, nor does season alone protect, although by far the greater number of cases occur in the late summer or autumn.

DIPHTHERIA.

One hundred and nine deaths occurred from this disease during the year. This also is a very satisfactory showing, as it is thirty less than was reported last year. When the public mind comprehends the fact that this disease is subject to control, by good sanitation and isolation, the rate of death from it will be represented by much smaller figures.

This is essentially a disease of childhood; only fourteen deaths from this malady were in persons above fifteen years of age. It becomes, then, a duty for parents to use every means within their knowledge and power to protect their children during the tender age in which this disease most severely and fatally flourishes.

CHOLERA INFANTUM.

The lives of 278 precious and innocent children, most of them within the realm of babyhood, the joy, the ambition, and perhaps the supremest happiness of watchful parents, were sacrificed by the ravages of this needless and preventable disease. The unsanitary localities of cities are the hot-beds of this infantile mortality. The greatest death rate from this disease in this state was at Manchester, where the mortality is large, furnishing 131 deaths. The percentage from this disease in Manchester, compared with the total mortality of the city, is 10.60, while for the rest of the state it is but 0.31. The population of Concord, Nashua, Dover, Portsmouth, and Keene aggregates 55,294 (over 20,000 more than the population of Manchester), yet the average percentage of deaths from cholera infantum to the total number of deaths in these five cities is only 3.33. The city of Manchester approximately contains one tenth part of the population of the state, yet nearly one half of the deaths from cholera infantum are reported from that city. These facts are telling

ones which the health authorities of that city ought to take into serious consideration.

SCARLET FEVER.

Only fifty-eight deaths occurred from this disease during the year. This is a very respectable showing, and results from two causes :

1st. The disease has prevailed in an unusually mild form.

2d. The public are better informed as to its real character, and recognize to a greater extent than ever before the importance of avoiding exposure to its contagion, and the value of isolation. With an increasing knowledge of this subject its mortality ought to be reduced to still smaller figures.

DISEASES OF THE NERVOUS SYSTEM.

Under this head may be placed the great majority of deaths classed under "heart disease," "paralysis," "apoplexy," and some kindred diseases. To properly review the causes which lead to such results would not only require a better classification of the cause of death, but an examination of all the agencies which bear upon both the physical and mental organization. To what extent the so-called progress in civilization, with its attendant excitement and rush and business anxiety, has contributed to increase this class of diseases, we are unable to say, because the past has given us no data for calculation ; but it is reasonable to presume that such causes are among the most potent.

EXPENSES.

The following expenses, chargeable to the annual appropriation, were incurred during the year :

Salary of secretary, ...	\$2,000.00
Travelling expenses of members, ...	188.08
Clerk (indexing, etc.), ...	225.00
Analysis of water and foods, ...	159.85
Library (binding books, etc.), ...	85.30
Extra printing, cuts, etc., ...	156.82
Total, ...	<u>\$2,815.05</u>

CONCLUSION.

In conclusion the secretary begs to say that much in this report is imperfectly and briefly discussed, owing to the great number of subjects necessarily considered, but he believes that they will be found to be of great importance to the people of the state, to whom they are respectfully presented.

Irving A. Watson.

Secretary State Board of Health.

SANITARY EXAMINATION OF DRINKING-WATER.

BY PROF. EDMUND R. ANGELL, DERRY, N. H.

The aim of the following article is to furnish every intelligent person with sufficient information to enable him, with trifling expense, to determine approximately the quality of the water which he drinks daily. It is not an easy matter to reduce the operations of water analysis to such simplicity that they may be readily used, and give accurate results; but it is believed that the methods brought forward in these pages, if carefully and patiently applied, will give in most cases reliable information concerning the sanitary condition of water; and it is hoped that the subject is presented in such a way as to be the means of awakening more interest in this very important subject. For when it is considered that three fourths of the human body is water, the need of maintaining the supply from pure sources begins to be realized. It is well known that thirst prostrates one sooner than hunger; the larger portion of the system evidently makes the more important demand. But water is no more necessary to life than pure water is to health. Because persons have drunk questionable water and still live, is no sign that they would not have lived better on pure water: because one survives a dose of poison, is no reason that poison is good, or even harmless.

How much poison is taken into the system from impure water it is difficult to say, but it is certain that experience and science, again and again, have traced sickness and death to this source; and it is reasonable, if badly polluted water causes severe and fatal disease, that slightly impure water may slowly undermine the health by being the cause of a host of ailments and incapacities of body for which the sufferer finds no apparent cause.

Let him who is afflicted in this way turn his attention to the various sanitary conditions of his surroundings, and especially to that of the water he drinks, that he may know whether or not every draught that quenches his thirst shortens his life; and let him who thinks he knows no ill, do the same, to the end that he may live many days free from evil.

Water may be injurious to health because it contains decomposing organic matter, either animal or vegetable, or because it contains some poisonous metal, usually lead.

In examining water, the first thing likely to be noticed is its appearance. Generally, polluted waters have various shades of a yellowish or brownish tint, which vary according to the amount of filth which they contain; but to this there are so many exceptions, that the color is by no means a safe guide. Some peaty waters, and those that contain iron, may have a yellowish or brownish tint, and yet be perfectly healthful. On the other hand, some very badly polluted waters are perfectly clear, and frequently present a better appearance than many pure waters.

The character of a water can seldom be determined from any one indication or test. The accumulated evidence of a number of tests is necessary for the formation of a correct opinion of its quality. Occasionally, from the most accurate and numerous tests that can be made in a fully equipped laboratory, it is impossible to pronounce on some waters, while others are so marked in character that a few tests declare at once what they are.

THE ODOR OF A WATER.

The smell of a water often gives some indication of its character. But it frequently happens that wholesome waters have an unpleasant odor: this is the case with some mineral waters. In clayey districts especially, water which is organically pure may have an objectional odor which is imparted by the clay. The waters of some lakes and rivers which supply some of our large cities, as Boston, New York, and Baltimore, have at times a peculiar "fish-like" odor. It generally begins in summer, but sometimes not until autumn. It is due, probably, to some condition of water plants,—whether to a state of growth, or decay, is uncertain. Growing plants emit odors peculiar to themselves: so it is not necessary to suppose that the odor mentioned arises

from decay. However it may be, there is yet no evidence that such water is injurious to the health of those who drink it.

TO DETECT THE SMELL OF WATER.

If the odor is very marked, of course there is no difficulty in perceiving it; when this is not the case, partly fill a clean bottle with the water to be tested, and after shaking it violently, so as to communicate the odor to the air within the bottle, smell of it. If this gives no result, warm the water. To do this so as not to break the bottle, place it in a kettle of cold water, and heat the whole together. Heat expels the gases dissolved in the water so that they may be detected. Finally the odor may be made more apparent by adding a little caustic potash to the water.

THE SUGAR TEST.

An easy and quite reliable test for organic matter in water is this: Add about ten grains of pure granulated sugar to about five ounces of the water to be tested: the bottle should be completely filled, and the stopper tightly fitted, so as to exclude the air. Expose the water to daylight and a temperature of about seventy degrees Fahrenheit. If it contains much organic matter, an abundance of whitish specks will appear within a day or two, floating around in the liquid. Of course the more organic matter there is, the more marked the appearance. These little bodies are best observed by holding the bottle against something black, or by partly shading the farther side of it with the hand. After a while they will group themselves together in bunches, and partly settle to the bottom of the bottle: at length, if the water is very bad, the odor of butyric acid (the smell of rancid butter) becomes perceptible.

CHLORINE.

This is a constituent of common salt, and is very widely distributed in nature. Good water on an average contains perhaps from 0.4 to 1.0 grain of chlorine per gallon. If a water contains more than this amount, it is a strong indication that it has received pollution from cesspools, sink-drains, or the excreta of animals, all of which are highly charged with salt. But some localities, especially those near the sea, contain more salt

than others; so that a good water in those districts may contain five, or even ten, grains of chlorine per gallon, for that is the natural amount. Before one could pronounce with some confidence on the sanitary condition of a water from the determination of chlorine alone, it would be necessary to know the average amount of it in the natural waters of the region: hence, if in a single instance a water contains more than the general average, and there are no other indications of impurity, it would be unwise to condemn it. On the other hand, it would be equally unwise to pronounce a water safe if it contains less than the average amount of chlorine; because waters very badly polluted with vegetable matter alone are deficient in chlorine. However, when chlorine is deficient it is certain that there is no contamination from animal matter.

It is possible for waters to contain salt that has come from filth, without containing the filth itself. When this is the case, one of two conditions exists: it may be indicative of a past pollution, or a warning of coming danger. Filth that had previously found access to the well may have undergone complete decomposition, while the salt remains; or filth may be so far from the well that nothing but its salt is washed through the intervening earth into it. Both conditions render the well unsafe, for in the one case another inflow of filth is liable to occur; in the other, the soil may soon become too fully charged with it to retain it all.

THE ESTIMATION OF CHLORINE.

To determine the approximate amount of chlorine, it is necessary to prepare a standard solution of salt. One ounce avoirdupois, 437.5 grains, of pure salt contains 265.5 grains of chlorine. If this be dissolved in 17.7 fluid ounces of water, each drop of the solution, reckoning 480 drops to the ounce, ought to contain $\frac{1}{32}$ grain of chlorine, since $(265.5 \times 32) \div 480 = 17.7$.

Weigh, as carefully as possible, one ounce avoirdupois of best table salt; dissolve it in eighteen ounces of clean rain-water. This solution will contain very nearly $\frac{1}{32}$ grain of chlorine per drop. The greatest care should be exercised in dropping the fluid, since the size of a drop varies so much. It should be dropped from an ounce bottle, and the drop allowed to form slowly.

Prepare a very weak solution of nitrate of silver, by dissolving a crystal, not larger than half a pea, in about one ounce of pure rain-water. There will be hardly any risk of making this solution too weak. Also prepare a solution of chromate of potash: bichromate of potash will answer the purpose if the chromate cannot be obtained. The solution should be made in rain-water. The strength of it is not important.

APPLICATION OF THE TEST.

Pour four ounces of the water to be tested into a saucer, and add enough chromate of potash solution to impart a distinct yellow color; then add a drop of the silver solution; a red color is produced where the drop strikes, from the formation of chromate of silver, which is quickly destroyed if the water contains much salt; continue to add the solution of silver drop by drop, counting the drops, and stirring the water after each additional drop, until it assumes a faint reddish tint, which will occur as soon as all the chlorine has been precipitated. Then pour four ounces of clean rain-water into another saucer, add one drop of the solution of salt, observing the precaution already given about the size of the drop, and proceed as before. If it takes a larger number of drops of the silver solution to produce a reddish tint in this than were required to produce it in the other case, the water tested contains less than one grain of chlorine per gallon, since $\frac{1}{32}$ grain in four ounces of water is at the rate of one grain in 128 fluid ounces, or one gallon. If more drops of the silver solution were added to the water than to the fluid used for comparison, it is easy, from the number of drops added to the latter, to estimate the chlorine in the former. For example, suppose ten drops of silver solution represent one grain of chlorine per gallon, and the water in question requires thirteen drops: then it contains 1.3 grains of chlorine per gallon. From this it will be seen that if the solution of nitrate of silver is sufficiently weak, it is possible to estimate very small quantities of chlorine, providing the quantity of salt in the fluid used for comparison be known. But on account of the difficulties in the way of weighing, measuring, and dropping, nothing but an approximation can be expected from the process. We think that by careful working the approximation may be made to exceed half a grain.

AMMONIA.

A minute and variable quantity of ammonia exists in the atmosphere. From this source rain-water receives it, which contains less than 0.5 part per million. The earth, in turn, absorbs it from rain-water, while some of it is destroyed by oxidation, so that rivers seldom contain more than 0.1 part per million, and perfectly pure spring or well water contains only a mere trace.

The ammonia process in water analysis is an indirect method of measuring the amount of organic matter which a water contains. Of course all the ammonia, as such, that any natural water might ever contain, is perfectly harmless. The decay of organic matter produces ammonia, and importance is attached to the latter only as it indicates the existence of the former.

In the laboratory two kinds of ammonia are recognized, "free" and "albuminoid." Free ammonia is that which has resulted naturally from the decay of organic matter contained in the water, and, other things being equal, shows how extensively such decomposition is going on. It is easily collected by distillation.

Albuminoid ammonia is that which results from hastening decomposition artificially. It measures the amount of organic matter present which may decay, and is simply what would be produced naturally in the course of time.

The ammonia process, when fully carried out, is the most reliable method known for determining the organic condition of water. To arrive at a correct conclusion in every case, it is necessary to estimate accurately both kinds of ammonia. The determination of albuminoid ammonia requires special apparatus, and is too complicated for general application; but the test for free ammonia is quite easily made, and from a series of experiments and observations it has been found that, generally, whenever a certain amount of free ammonia occurs in well-water, an excess of albuminoid ammonia is almost sure to exist. So it is pretty safe to conclude that such water is polluted. Says an authority, "When the free ammonia exceeds 0.08 parts per million, it almost invariably proceeds from the fermentation of urea into carbonate of ammonia, and is a sign that the water in question consists of diluted urine in a very recent condition."

In these instances the water will likewise be found to be loaded with chlorides." Our experience places the amount a little higher than 0.08. We believe if a water contains 0.1 part per million of free ammonia, it should be regarded organically impure, especially if other indications point the same way. Of course there are exceptions. Some waters, organically pure, naturally contain much free ammonia, while others, that are badly polluted with vegetable matter, may contain sometimes much less than 0.1 part per million. In such cases the determination of albuminoid ammonia is indispensable to the detection of pollution. It is to be regretted that there is no simple and reliable method for doing this. But the cases are rare where water polluted with vegetable matter contains less than 0.1 part of free ammonia per million.

THE DETECTION OF AMMONIA.

The following process for detecting and estimating free ammonia is sufficiently simple and accurate for general application :

Dissolve some mercuric chloride (corrosive sublimate, a poison) in a little water, making the solution quite strong. Also prepare a strong solution of carbonate of soda (common cooking soda will do) by dissolving it in water. Place a tumbler of clear glass on a black surface in good light; fill it with the water to be tested, and then add a single drop of the solution of mercuric chloride, followed by a drop of the soda solution in the same place. Let the liquid stand without stirring. Look down through it, and if ammonia is present, even a minute quantity, a white cloud or opalescence, resembling white smoke, will be observed towards the bottom of the glass where the drops passed, which in the course of some hours will settle and cover the whole or part of the bottom of the glass with a white coating. If much ammonia is present, the reaction will be very marked, and almost instantaneous. Less ammonia requires more time, and the reaction is less marked.

The delicacy of the test is sufficient to give within five minutes a distinct reaction in water containing $\frac{1}{1,000,000}$ part of its weight of ammonia. Any one can satisfy himself of the delicacy of the test, by the following: Add to a spoonful of water free

from ammonia (water that has been boiled for some time) a single drop of ordinary ammonia; then add a drop of this to a tumbler of water that has been well boiled, and apply the test in the manner described above.

If water shows the reaction, it is far from the sanitary standard for purity, which, as has been said, is not more than 0.1 part per million, and this number is ten times less than $\frac{1}{1,000,000}$, the limit of the test. Consequently, a water may contain too much ammonia and not show the reaction. To obviate this difficulty, a simple process of distillation must be employed.

If all the ammonia that ten volumes of water contain could be collected in one volume of water, and the test applied to this and a reaction occur, it is evident that the water in question contains at least 0.1 part per million. To effect the distillation, add two and a half quarts of water to a teakettle, and less if this quantity should come above the spout; then wrap one or two towels around a perfectly clean milk-can, covering the sides and bottom well. The can may be of any size, one that will hold two quarts is convenient. If a can is not to be had, a fruit jar, or a large pitcher, will answer the purpose. Support the can in a nearly horizontal position so the spout of the kettle shall be in the mouth of it. Keep the towels wet by pouring cold water upon them constantly after the water begins to boil. A basin should be placed beneath to catch the water as it runs from the towels. The steam, together with the ammonia, will be condensed in the can. When a half pint, or a tenth, of the water has come over, the operation should be stopped, and the condensed water tested, as described above. If no reaction occurs within five minutes, the water is sufficiently free from ammonia. If a milk-can is used for the condenser, it should be most thoroughly cleaned, otherwise the condensed water will have a milky appearance, which will greatly interfere with seeing the reaction.

NITRATES AND NITRITES.

The presence of these salts is a bad indication only so far as they have resulted from the oxidation of nitrogenous organic matter. Nitrates contain more oxygen than nitrites, and have required more time for their formation. Their occurrence, taken

alone, teaches nothing positive; taken in connection with other evidence, it gives valuable information. But as a rule, the presence of more than a trace of either salt is a strong indication of pollution from animal matter. However, some pure waters contain nitrates which they have dissolved from the earth and rocks of the locality. On the other hand, some very bad waters, especially those contaminated with vegetable matter, do not contain a trace.

A little nitric acid exists in the atmosphere, coming probably from the oxidation of ammonia. Hence rain-water contains it, and surface-water receives an additional supply from the oxidation of nitrogenous matter on the ground. It is then absorbed largely by the rootlets of plants. Hence shallow wells may receive it from surface-water. Other things being equal, they would naturally contain more of it when vegetation does not flourish.

The importance that is to be attached to distinguishing whether the nitrogen compound is a nitrate or nitrite, is this generally: If nitrites occur, it would seem to show that the pollution is recent, or its source very near. If nitrates alone exist, it would be inferred that there has been time enough for complete oxidation, and hence the pollution is of longer standing, or its source far away. It sometimes happens that the occurrence of nitrates indicates the approach of pollution instead of showing actual or past pollution. This is especially the case when there is no other evidence of impurity, unless it is that of chlorine, for the soil about a well acts as a filter to retain deleterious matter, letting pass through it only the ultimate products of decomposition, which are in themselves harmless, until it becomes so saturated with filth that it can no longer accomplish this.

NITRATES AND NITRITES DETECTED.

The following method for detecting nitrates and nitrites is delicate and easily applied:

Melt some zinc in a ladle, or iron spoon; stand in a chair and pour the melted metal in a fine stream into a pail of water standing on the floor. This granulates the zinc so it presents the greatest extent of bright surface. Prepare a little thin starch

paste in the ordinary manner, dissolve a few grains of iodide of potash in water, and mix it thoroughly with the paste. Have at hand a little sulphuric acid.

To test for nitrites, add half a teaspoonful of the iodide of starch solution to a tumbler of water, and allow to mix. Then add a single drop of sulphuric acid. If any more than a trace of nitrous acid is present, a distinct blue color will result almost immediately. The test is so delicate that it gives, within a few seconds, a distinct reaction in water containing only the one hundred thousandth part of its weight of nitrous acid. And within a few minutes it will reveal less than one millionth part of it. If the color does not appear at the end of a few minutes, it may be decided that no nitrous acid resulting from filth is present. After standing several hours, the liquid usually assumes a blue color from the infinitesimal amount of the acid that may naturally exist in the water.

If no nitrous acid, or but very little, is present, test for nitric acid as follows: Pour a pint of the water into a small nappy, add a spoonful of granulated zinc, and boil until about half of the water is driven off. This process reduces the nitric acid to nitrous acid. Let it cool and settle. Carefully pour off the clear liquid, and test by the method given above. If nitrous acid has been found previously, it will be necessary to notice whether the reaction in this case is more prompt and marked. It is well to have two glasses in readiness at the same time, one containing the water as it came from the well, the other, that which has been boiled with zinc; add a little of the iodide of starch solution, and then a drop of sulphuric acid to each, as nearly at the same time as possible, and notice whether the reaction occurs in one sooner than in the other, as well as whether the color varies in intensity. If much nitrous acid occurs, it will be impossible to detect nitric acid by this process. When this is the case, the detection of nitric acid is not important. If a quite prompt and marked reaction for either nitrous or nitric acid takes place, the quantity is sufficient to render the water suspicious, and their presence forms a very valuable confirmatory indication of pollution in cases where a doubtful quantity of chlorine or ammonia occurs.

Any one desiring to do so, can easily perform interesting and

instructive experiments by operating on water in which a little nitrate of potash (saltpetre) has been dissolved.

LEAD AND IRON.

It is of the utmost importance to know whether water used for drinking purposes contains lead. A little gradually taken into the system does not pass off, but accumulates until the quantity is sufficient to result in bad, if not fatal, consequences. Since the poison is so insidious in its action, one does not receive warning until it is too late.

If a piece of bright lead is exposed to moist air, it soon becomes tarnished from the formation of a thin film of protoxide of lead, produced by the action of atmospheric oxygen. If this piece of lead should be now placed in water perfectly pure and free from air, the oxide would dissolve, leaving the metal bright, after which there would be no further action, since no more oxide could form. But if air had access to the water, the twofold action of oxidation and solution would continue together, and the surface of the metal would remain more or less bright, according as the oxide is formed faster or slower than it can dissolve. If some sulphate or carbonate be now added to the water, these salts immediately react with the oxide to form on the metal an insoluble coating of carbonate or sulphate of lead, which, being insoluble in water, prevents further action. These facts explain the behavior of natural waters toward lead. In the first place the protoxide of lead is always formed, which dissolves if the water does not contain the necessary saline constituents to prevent it. Water that contains any salt of lime or magnesia in excess is called hard water. Generally these bases are present in the form of carbonates or sulphates: hence the commonly accepted view that hard water does not act on lead. But here is an error that must be guarded against. The water fails to act on lead, not because it is hard, but because it contains sulphates or carbonates. A soft water, containing sulphates or carbonates of the alkalies, has no action on lead. On the other hand, a water hard from the presence of carbonate of lime or magnesia frequently acts on lead freely, because the same acid that dissolves them and explains their presence, also dissolves carbonate of lead. Hence it is plain that some very

hard waters, highly charged with carbonic acid, readily act on lead. The decomposition of organic matter produces carbonic acid; consequently the presence of organic matter facilitates the action of water on lead. Nitrates dissolve lead freely. The metal should not be used in waters containing them. Sulphates in water protect lead most, since the sulphate of lead is insoluble in water and acids. Carbonates are next in order. The carbonate of lead is insoluble in water, but soluble in acids, even the weak carbonate acid.

Water that is hard is so, generally, from the presence of sulphates or carbonates of lime and magnesia, so that ordinarily it might be considered safe to use lead in hard water. But since there are exceptions both against hard water and in favor of soft water, the only safe way is to test every water in which lead is used.

Hard water is readily known from its behavior with soap. In such water considerable soap is required to produce a foam, and quite a quantity of white or gray flakes will appear on the surface of the water. This substance is really lime, or magnesia soap, these bases having taken the place of the soda and the potash which the soap contained. When the hands are washed in hard water, unless enough soap is used to make a good foam, it is impossible to give them a clean feeling. The hardness of water may be an indication that it does not act on lead.

Another rough method is, to observe whether the surface of lead which has been in water for some time is bright and shining, like newly cut metal, or is dull in color, very gray, or brownish. Too much reliance should not be placed upon the color, for the oxide may not dissolve fast enough to keep the metal bright, and yet too much may dissolve. However, if the surface is bright and clean, the evidence is decisive; for it would not be so if the oxide did not dissolve.

THE TEST FOR LEAD.

Prepare a solution of sulphide of soda as follows: Thoroughly mix a small quantity of sulphur (about a teaspoonful) with twice its quantity of cooking soda; put the mixture in an iron spoon, or ladle, and heat it over the coals until it is well melted and the flame of the sulphur has gone out. Scrape the black residue from

the spoon, and add to it in a small bottle an ounce of water. Let the solution stand for several hours until the insoluble parts have settled, then pour off the clear, yellowish green liquid into another bottle. Have at hand a little hydrochloric acid (muriatic acid). Fill a tumbler of clear glass with the water to be tested; place it on a white surface in good light; add one drop of the sulphide of soda solution, stir the liquid, and if lead is present it will assume a brownish black color, the depth of color depending on the amount of lead. To ascertain whether the color is due to lead and not to iron (for the sulphide of iron is also black), add to the solution a single drop of hydrochloric acid, and stir it. Do not add the acid until after the sulphide has been added. If the color disappears, it is due to iron; if it grows paler, but does not disappear wholly, it is partly due to iron and partly to lead; and if the color does not change, lead is the cause of it. After the acid is added the liquid is apt to assume a slightly milky appearance from the separation of sulphur. Care must be exercised not to confuse this with an actual fading of the color.

Good water should contain less than one tenth grain of lead per gallon. The test gives a distinct reaction with less than this amount. But the exact quantity cannot be determined outside of the laboratory. Unless one is so particular to know the amount as to have the work done, it is best to reject a water that gives any coloration with the test, since it is safer to drink no lead at all.

IRON.

It is not often that a water is found which contains enough iron to be prejudicial to health. Some authorities say that there ought not to be more than two tenths grain per gallon, and others think that water containing one half grain per gallon is not injurious.

Iron is detected by means of sulphide of soda and hydrochloric acid. If no lead is present, the color produced by the sulphide must dissolve completely on the addition of two or three drops of acid.

If it be desirable to learn whether there is more than half a grain of iron in a gallon of any water, dissolve one ounce avoirdupois of sulphate of iron (copperas) in eleven ounces of water.

Each drop of this solution contains about one sixty-fourth grain of iron. Add one drop of the solution to four ounces of pure water, which will then contain iron at the rate of about one half grain per gallon. Add to this a drop of sulphide of soda, and compare the color with that of the water in question.

THE PERMANGANATE OF POTASH.—TEST FOR ORGANIC MATTER.

The union of oxygen with dead organic matter always occurs when the two are brought together under favorable circumstances, and the disappearance of the one may be made to reveal the presence of the other.

The solution of permanganate of potash has an intensely deep purple color, which is owing to the oxygen it contains. Whenever this solution is brought in contact with easily oxidizable substances, it loses its oxygen and consequently its color. If, therefore, enough of the solution be added to a suspected water to impart a distinct tint, and the color disappears, it is certain that something is present which is capable of taking the oxygen from the permanganate. Whether this is organic matter, or something else, is uncertain without the application of other tests. The only other substances which are apt to occur in a water, and are capable of effecting the change, are ferrous salts, nitrites, and hydrogen sulphide. If these are known to be absent, and the color of the permanganate disappears, it may be decided that organic matter is present. But if either of these occurs, the test has no value.

The methods for detecting nitrites and iron, which is most always, when present, in the form of a ferrous salt, have been given. Sometimes, however, iron occurs in water as a ferric salt. This does not affect the permanganate; but the method given for detecting iron makes no distinction between its two classes of salts. To distinguish them is too difficult, except for the chemist.

To detect hydrogen sulphide, shake some of the water in a clean bottle, and observe the odor, which is the same as that emitted by the solution of sulphide of soda.

It is another drawback to the permanganate test that it does not act on albuminous substances, urea, kreatin, sugar, gelatine, or fatty matters. So that a water might be very badly polluted

and yet give no indication of it with this test. Cases are recorded where sickness resulted from the use of water supposed to be good, because it did not affect the permanganate. Other instances are recorded where good water was condemned from the application of this test. From what has been said, it will be seen that this test alone is reliable only when iron, nitrites, and hydrogen sulphide are known to be absent, and at the same time the color of the solution disappears. It is often valuable as a confirmatory test, and for that purpose it is described here.

The solution is easily prepared by dissolving the crystals of permanganate of potash in pure water. To apply the test, take two tumblers of clear glass: fill one with water of known purity, and the other, with the water to be tested: then add a drop of the solution to each, and compare the change in color. Those who have been accustomed to work by this method are guided by the following rules: "If decomposing organic matter be present in a degree hurtful to health, the pink color is changed to dull yellow; or, if a still larger quantity exists in the water, the color will in time entirely disappear. Where the color is rendered paler, but still retains a decided reddish tinge, then, although putrefying organic matter is present, it is so in such minute quantities as are not likely to be immediately hurtful. The quicker and more perfect the decoloration of the water tested, the greater is the quantity of decomposing organic matter.

The following preparation of permanganate is a more delicate and perhaps a more reliable test than the simple solution:

Caustic potash,	.	.	.	4 parts by weight,
Permanganate of potash,	.	.	.	1 part "
Distilled water,	.	.	.	160 parts "

If it is found inconvenient to weigh the very deliquescent caustic potash, the liquor potassæ of commerce may be substituted. Then the formula is:

Liq. potassæ,	.	.	.	.	.	70 parts,
Distilled water,	.	.	.	.	.	90 "
Permanganate of potash,	.	.	.	.	.	1 part.

If the solution is kept in a glass-stoppered bottle in a dark place, it will remain good for a year or more. This test is applied in the same manner as the simple solution. It is claimed that water of average good quality, with this test, will keep its color well for forty-eight hours. If it becomes decidedly paler in twenty-four hours, it is hardly fit to use. Those who employ the method do not claim for it scientific accuracy, but think, in the absence of opportunity for a more careful analysis, a ready and reliable conclusion may be reached. We think the claim for reliability is too strong on account of the same reasons that were given under the description of the simple solution.

It would be interesting and profitable for any one purposing to use the permanganate test in either form, to collect samples of water from several sources,—wells, springs, brooks, and stagnant pools,—and to apply the test to them, comparing the results. It would be well to do the following also: Add a little sulphate of iron to water distinctly colored with permanganate. The color will quickly disappear. Repeat the experiment, using nitrite of potash, having prepared some by boiling a solution of saltpetre with zinc. The effect of hydrogen sulphide may be seen by doing the experiment with sulphide of soda.

INTERPRETATION OF RESULTS.

Nearly enough has been said under the several divisions to direct one to fair conclusions. It must not be inferred that the methods presented here are infallible guides to the quality of a water. All that can be claimed for them is, that in most cases they will reveal the character of waters which are so polluted as to be immediately injurious to health. Some, that are polluted with vegetable matter alone, may escape detection. Other tests, which cannot be used by people generally, must be made before all that can be known of a water will be revealed.

It is seldom that a bad water will show all the indications that have been described. If an excess of both chlorine and ammonia occurs, the water is polluted with animal matter or with drains. If considerable chlorine is present together with a strong reaction for nitrates or nitrites, while ammonia is not found by means of the test described, a past or future pollution is indicated. If an excess of ammonia alone occurs, contamina-

tion from vegetable matter is suggested, which becomes quite certain if the sugar test and the permanganate of potash have given a reaction.

But there are more conditions and variations than can be specified for every case. The application of the tests, and an examination of the surroundings of a well, together with thought and judgment, will usually lead to the right conclusion.

FACTS REGARDING SANITARY WORK.

BY CARL H. HORSCH, M. D., DOVER.

The continually increasing interest in and better comprehension of sanitation are among the best humanitarian endeavors of a nation. The improvements in heating, lighting, ventilating, and draining public and private buildings; the efforts for better sewerage and supplies of pure water; more vigilance against nuisances, contamination of water and air, and the overcrowding of school-houses; the legal condemnation and forfeiture of spoiled animal and vegetable food; better quarantine, and isolation of contagious and infectious cases; enforcement of registration of births and deaths; examination and inspection of deceased persons and burial permits, for the better protection against being buried alive; and for the detection of murder, suicide, life-insurance frauds, and concealed contagious and infectious diseases;—all these are measures which prove the intelligence, benevolence, and culture of a nation.

MEDICAL COLLEGES.

The National Board of Health, the several state and local boards, the sanitary conventions held in various states under their auspices, the American Public Health Association, the American Medical Association, and numerous state and local medical societies, are making earnest efforts for better sanitary conditions, for a higher standard of medical education, for a more appropriate degree of classical culture, as a necessity for admission to medical colleges, a longer term of study, and more clinical instruction therein, and the establishment of post-graduate courses of study; also, for legislative enactments to prevent the adulteration of food and drugs, and to protect the public from charlatanism and quackery. Pharmacy laws are in

force already, to a greater or less degree, in twelve states and in the District of Columbia. Such endeavors are among the best efforts which can be made for the welfare of humanity; and when one considers how much of these better conditions is due to the medical profession, he will be fully convinced that the slanders, denunciations, and depreciations so often applied to that body are utterly unmerited.

The following extract from the *Sanitary News*, of Chicago (Jan. 15, 1844), shows how much has been done in that city during the past year:

In his annual report for 1883, as chief of the bureau of tenement and factory inspection of Chicago, Mr. W. H. Genung reported 3,744 examinations of tenement houses, containing 42,331 persons. From his experience he recommends an annual house-to-house inspection of all tenements during the months of April, May, and June, in order, as he says, "that the neglected repairs and accumulations of the winter months may be rapidly and effectually made or remedied, and a considerable cause for sickness and possible death done away with." This is a valuable suggestion, and it is hoped that when the municipal year draws to a close and the new year begins, there will be no derangement of the plans of the health department by reason of a lack of inspectors to do the work.

The permits issued for buildings for habitation during the year, by the health department, amounted to 2,444. These were intended for housing 4,551 families, or an estimated population of 18,204. Of the permits issued, 1,162 were for flats, or houses intended for one family only on one floor. Chief Inspector Genung recommends, as the rent of these flats is far beyond the ability of the laboring man and clerk to pay, that buildings four or more stories in height be erected on cross streets near the centres of business, and leased on reasonable terms to such persons.

The health department during the year abated 13,591 nuisances, made 584 sewer connections, condemned 186,879 pounds of meat, brought 308 suits for violation of health ordinances, and had 115 cases of small-pox. The death-rate for the year was 20.6 per one thousand, or three per one thousand less than in 1882.

The city government of Dover, N. H., passed the following ordinances:

ORDINANCE IN AMENDMENT OF CHAPTER 17, CITY ORDINANCES.

Be it ordained by the City Councils of the city of Dover:

That Chapter 17 of the City Ordinances (relating to vital statistics and funeral undertakers) be amended, after Sec. 2, to read as follows:

SEC. 3. Whenever any person shall die within the limits of the city, it shall be the duty of the physician attending such person during his or her last sickness, to examine the body of such deceased person before the burial thereof, and to make out and sign a certificate, setting forth, as far as the same may be ascertained, the name, age, color, sex, nativity, occupation, whether married or single, duration of residence in the city, cause, date, and place of death of such deceased person; and it shall be the duty of the undertaker or other person in charge of the burial of such deceased person, to add to such certificate the date and place of burial, and having duly signed the same, to deposit it with the city clerk and obtain a permit for burial; and in the case of death from any contagious or infectious disease, said certificate shall be made and forwarded immediately.

SEC. 4. Whenever a permit for burial is applied for, in case of death without the attendance of a physician, or it is impossible to obtain a physician's certificate, it shall be the duty of the city physician to make the necessary examination, and to investigate the case, and make and sign a certificate of the probable cause of death; and if not satisfied as to the cause and circumstances attending such death, he shall so report to the mayor.

SEC. 5. No interment or disinterment of the dead body of any human being, or disposition thereof in any tomb, vault, or cemetery, shall be made within the city without a permit therefor, granted as aforesaid, nor otherwise than in accordance with such permit.

No undertaker, superintendent of cemetery, or other person, shall assist in, assent to, or allow any such interment or disinterment to be made until such permit has been given as aforesaid; and it shall be the duty of every undertaker, superintendent of cemetery, or other person having charge of any burial-place as aforesaid, who shall receive such permit, to preserve and return the same to the city clerk within forty-eight hours from the time of said burial.

No dead body of any human being from without the limits of the city shall be received into or allowed to be buried in any cemetery or other place of interment in said city, unless the person in charge, superintendent of cemetery, or undertaker, shall have first obtained a permit from the city clerk; said permit to be issued upon the certificate of the physician who attended the deceased during his or her last sickness.

Any person violating any of the provisions of this chapter shall be fined not less than ten nor more than twenty dollars.

Passed April 10, 1883.

Be it ordained by the City Council of the city of Dover :

That the fee for examining and inspecting the bodies of deceased persons, as required by Sec. 3, Chap. 17, of the City Ordinances, be and

hereby is one dollar for each inspection, which shall be paid by the city of Dover.

Passed October 4, 1883.

Here follow some historical facts regarding that humanitarian measure in Germany, translated from the *Encyclopædia of State Medicine*, G. F. Most, M. D., Leipzig, 1840 :

In all the German states the wise ordinance exists, that no dead human body shall be buried before three whole days (72 hours) have elapsed ; and every body must be thoroughly examined by competent inspectors before it is taken from the bed and prepared for burial. Exceptions are made in cases of contagious and infectious diseases, and when decomposition takes place before the above-mentioned time. If this law is strictly carried out, premature burials will not be so likely to take place as in France. There are many indubitable cases of persons having been longer than three days in a condition of apparent death, and, even under unfavorable circumstances, brought to life again.

In 1797, a working man in Vienna was declared to be dead by the inspector, and the body was placed in the public tomb to await interment. The sexton, while making preparations for the burial, heard a noise in the tomb, and found it proceeded from the coffin. On this being opened the apparent dead man sat up, and was carried home, and recovered. The inspector, a much respected surgeon, lost his situation.

Through the efforts of Dr. Hufeland, the first public *leichenhaus* was erected in Weimer, in 1791.* Berlin followed the good example in 1797 ; Mayence in 1803 ; Munich in 1818 ; Dresden, Frankfort on the Main, and Leipzig, in 1834 : and now (1840) this excellent institution is in use in many other German cities.

These buildings are used for the reception of all bodies of deceased persons which cannot be properly cared for elsewhere, and especially for the accommodation of the poor. All bodies are placed therein without regard to age, religion, social rank, or cause of death. Every one receives the same care. The rooms are kept perfectly clean, and the bodies are under constant care and vigilance. The inspecting physician visits the house daily, but whenever the signs of death are not well devel-

oped, and doubts exist, he must go several times daily, and under some circumstances he must call a consultation.

The Grand Duchy of Hesse passed the following law in 1824 :

Only well qualified physicians and surgeons shall be appointed inspectors of the bodies of deceased persons.

No burials shall be permitted until the signs of decomposition are developed.

If the body cannot be kept in the house wherein the person died, it must be placed in the *leichenhaus* and watched.

Dr. Hufeland says, " When I think of the great benefit and the simple arrangements of such measures, there is no doubt in my mind that they will soon be very generally carried out. Every true philanthropist will make the best efforts for them in the community where he lives.

" The holiest duties of humanity, the love of children, parents, husbands, and wives, and self-preservation, demand of us that we shall not neglect those means and the only ones by which our beloved ones can be saved from the terrible fate which only a tyrant can forge upon his victims,—the only ones whereby in future the groans in the grave, the dreadful accusers of our negligence, may be averted."

In the following report we find good efforts for better sanitary conditions in some school-houses in Dover, N. H. :

REPORT OF THE JOINT STANDING COMMITTEE ON SCHOOL-HOUSES,
DOVER, N. H.

At the Hurd-street house the openings to supply fresh (?) cold air to the furnaces were opposite to and within a few feet of the entrance to the privy, so that there was constant danger at all times, with almost absolute certainty with wind from the north, for the foul air therefrom being taken into the school-rooms. These cold-air flues have been removed to as near the corners of the building as possible, thereby insuring a much purer supply of air.

The causes of the sickening odors which at times came up through the furnaces at the high school-house were discovered and remedied.

The largest expenditure was incurred at the Sawyer school. The sanitary condition of this building was exceedingly defective, and was beginning to cause a wide-spread alarm among parents.

All the water-closets for the eight schools in this building were in the west end of the cellar, against the wall. Not more than a quarter part

of them received direct light from the windows; the remainder were lighted from the cellar. It was quite dark until the afternoon, and then a few were perfectly dark. The drain was wholly inadequate to the work required of it: the wood-work was badly decayed. The only means of ventilation were the cellar windows, which were necessarily kept closed in winter to prevent the water-tanks from freezing, and the noxious gases rose into the halls and school-rooms. A complete renovation was needed. Everything was taken out, and the cellar thoroughly cleansed. The closets were placed twelve feet from and facing the wall, so that all are well lighted. The wooden floor was replaced by cement. Each hopper is furnished with an "Albee" patent ventilator, connected by pipes to the flues in the chimneys. A large cemented drain, with a fall of one inch to five feet, was laid. This, besides being thoroughly trapped, is also connected with the ventilators, to avoid any dangerous gas working into the cellar through the hopper-traps. The outside drain, from the cellar wall to the cesspool, was wholly rebuilt, enlarged, and lowered, to give more fall. Every part of the work is arranged so that it can be easily reached in case of obstruction, which, however, we are confident can only occur by the water-supply giving out, or through malice: against the latter cause the janitor reports that he is obliged to be constantly on the watch.

Every bill has been paid. The outlay has been large, but one dangerous source of diphtheria and typhoid fever has been stopped. If the future city government will make as liberal appropriations as the retiring one has done, the sanitary condition of our school-houses can be vastly improved, and the buildings and grounds made an ornament to the city.

L. B. LASKEY,
JAS. W. BARTLETT,
CHAS. T. MOULTON,

Committee.

CHRONIC ZYMOTIC DISEASE SIMULATING CONSUMPTION.*

BY D. M. CURRIER, M.D., NEWPORT, N. H.

One of our late lamented presidents of the state society, one whose words were always listened to with pleasure and profit, and under whose instruction many honored physicians of this state and others have sat, said in his annual address, in referring to younger members of the society,—“Never let anything prevent your fulfilling any task once assigned to you by this society;” and it was my secret resolve, when I became a member of this Centre Medical Society, to humbly fulfil every task with which it might honor me, according to my best ability, no matter how incompetent I felt. So when our worthy secretary announced that the executive committee had assigned to me the report on the practice of medicine, I accepted without a demur or an excuse, and am thus before you to-day.

As I am given the broad field of the practice of medicine from which to select my subject, I will refer to some of the chronic diseases that in my opinion are the result of unhealthful surroundings, and simulate consumption to a greater or less degree. In no direction is the medical profession of to-day pushing its investigations so rapidly, or making such advancement, as in the causes and prevention of acute zymotic disease. It is when the onslaught is rapid and violent, and the victims to unsanitary conditions fall thick and fast around us, that we have a realizing sense of the terrible penalty the goddess Hygeia places upon those that disobey her laws. Then we are

*This paper was read before the Centre District Medical Society, and on account of its relation to public hygiene it was referred to the State Board of Health by vote of the society.

active in looking around to see from what point the noxious principle finds its way into the system, and, if possible, how we can prevent its entrance thereto. But when it works more slowly, but, perhaps, none the less surely and fatally,—when we can lay back resigned to fate by calling it consumption, or chronic bronchitis, or liver complaint, or chronic rheumatism, or nervous prostration,—then it is, perhaps, in too many instances, that we cease to look for the cause in the surroundings of the patient, to see what kind of water he is drinking, air he is breathing, the emanations he is taking in from the very filth he is obliged to generate in order to live; whereas, if the same cause in another system had produced diphtheria or typhoid fever, we should have been actively alert to discover the cause.

My attention has been directed to this class of diseases by observing several cases that passed by the general term consumption, but where the symptoms did not, when critically examined, substantiate the diagnosis, but which we were obliged to let pass by that name for the want of a better term to convey to the minds of the anxious friends and the patient himself an idea of his condition.

For instance, in 1879 I was called to treat R. T., age 60, male, who was said to have consumption, but the call was more particularly for the relief of gall stones, from which he suffered greatly at times. The Carlsbad salts completely relieved him of this trouble in a few weeks. After this he developed a hydatid cyst of the liver, which, having greatly distended his right side, burst into and ran off through the bowels. The encroachment on the right lung by this was so great that the lower lobe was destroyed by the pressure. For some weeks before and after the bursting of the cyst, the cough would occur in paroxysms, accompanied with blood and rusty sputa.

One year after the cyst broke, the cough continued severe, expectoration profuse, but clear and frothy. A careful examination of the lungs at this time revealed no evidence of tubercles, but a severe bronchitis. There were periods of great prostration, very oppressive dyspœna, with a tendency to be cold upon the least exposure. Still he was not greatly emaciated, and did not appear like one in the last stages of consumption. About this

time I remarked to him that he appeared like a person whose blood was poisoned, and asked him if he had ever lived in a place where that could occur. He told me he once owned a store in Penacook (which I believe lies mostly within the limits of Concord), under which was situated a canal to convey water-power for manufacturing purposes. This canal, I am informed, is eighteen feet across and twelve feet deep. It discharges itself at several points, going to different wheels, but at no point does it discharge at a greater distance than four feet from the top of the canal, and these were wholly shut off through the night; so it left all the water in the canal during that time in a state of stagnation, and two thirds of it in the same condition through the day, as the bulk-head was never removed in order to flush the canal and remove the accumulated *débris*. People who have lived in the place tell me that water from the canal finds its way into the cellars in the vicinity, and that the wells are affected thereby.

This canal serves the purpose of a public sewer, inasmuch as it receives the drainage from two or three stables, and several sink-spouts and privies empty their contents directly into its water. Over and above all this, it is the general receptacle of all the drainage and filth in the vicinity, and a cemetery for all the defunct rats, cats, and dogs in the neighborhood. My patient told me, and it has been corroborated by others, that when he went to the store in the morning, steam and gases could be seen issuing from under the building between the foundation stones, and, upon entering, it always contained a peculiar, nasty, disagreeable odor. After opening the doors and windows it would pass off, and would not be noticed through the day. He told me that he lost his health while doing business in this place, and had not been well since. Upon hearing this, I put him upon a strong antiseptic treatment, both into the stomach and to inhale into the lungs. The result was immediate improvement in every respect, and at this date he says he feels more like getting well than for many years. It was in 1864 that he was obliged to give up his business, completely broken down in health. I have been told that from that time to 1876 or 1877 this store was occupied by nine different individuals, all of whom died from what was called consumption, though it

is said some of the cases did not resemble that disease, in that they were not greatly emaciated, but that they all had a cough. Besides these nine spoken of above, many more that were employed in and about the building lost their health and went away, and whether they recovered or not we were not able to learn, excepting in the instance of one of the men (who, after giving up business, came to Newport and died) that had a daughter work for him in the shop connected with the store, who sickened and died, and the girl that took her place did the same in less than one year. Now if there is a place within the border of our state where nine strong, healthy, robust men, in but little more than that number of years, without any predisposition thereto, have contracted consumption and died, it must be a fit place for the investigation of our State Board of Health; and I think if the proprietors would consult that high authority, they would be able to give them some suggestions that would be of inestimable value to them, without any very large outlay on their property. No such death-trap should be allowed to exist.

Another instance in point, where the effect lay between typhoid fever and consumption, with a decided preponderance in favor of the latter, and caused by drinking impure well water, was reported and published in the report of the State Board of Health for 1883, in which the analysis of the water is given (pp. 263-269). On this farm nine persons died,—two of typhoid fever, one of gall-stones, and six of consumption, the last of which was the only one that I had under personal observation. A general survey of this case would give one the impression that he was suffering from tubercular deposit in the lungs, but upon thorough examination of the chest no evidence of tubercles could be found. There was equal resonance over both lungs, which were equally and fully distended by a forced inspiration. He had chronic laryngo-pharyngitis, with aphonia. There was great and constant irritation of the stomach, as manifested by frequent nausea and vomiting of food, with progressive weakness and low vitality. This went on, and the man died, not, in my opinion, from tubercular consumption, but from what I believe to be chronic poisoning by the filthy water he drank.

Still another instance, but a little varied—a lady living upon a farm. She has a tawny, almost jaundiced condition of the skin.

She suffers very much from headache and a bad feeling at the stomach, with cough and expectoration, eczema of hands, and prostration. All treatment proved unavailing until the condition of the water used for domestic purposes was examined. The well from which the supply was obtained was some sixteen feet deep, and was found to be within fifteen feet of barn-yard, stable, hen-house, hog-pen, slaughter-house, and privy, with a large amount of hen manure and other filth lying loose on top of the ground immediately round the well. After examining the water it was severely condemned. The family, with rare good sense, and a confidence in their medical adviser which was really cheering, commenced at once to draw their water from a purer fountain. The result was, that almost immediately and without medication the headache disappeared, the intractable sores on the hands healed of their own accord, and the jaundiced skin was cast off for the more white and rosy hue of health and earlier life.

In consideration of these facts, I can come to no other conclusion than that many of the chronic complaints with which we have to deal are the result of unsanitary surroundings; and if we meet with cases of the before-mentioned diseases, viz., chronic bronchitis, consumption, disease of liver, dyspepsia, and nervous prostration,—and we might add to these chronic sore throat, chronic rheumatism, or persistent pain in any part of the body, that does not readily yield to treatment, or that present peculiar or unusual symptoms,—I think it would be well to examine the premises with the same assiduity that we should if the patient had diphtheria or typhoid fever, to see what his daily surroundings are. In short, to examine the sanitary condition of his residence in all its features.

If it is true, as the advanced medical thought of the day would have us believe, that consumption is purely and simply the result of living organisms developed in the lungs; if the germ theory of disease is destined to prove the true one,—then the sooner we wake up to the fact that there are various chronic zymotic diseases the better. If a certain specie of bacteria is the peculiar germ of consumption, it requires no very great stretch of the imagination to believe that a little different species of bacteria may bear the same relationship to bronchitis, or that

the different infusoria may each produce its own particular disease, and that these may continue indefinitely in the system, by their own mode of reproduction and development. Nature may continue to wage a valiant warfare against these invaders for years, until at last, exhausted by the strife, it yields to the power of numbers, a standing example of the fact that the small things of this world are capable of confounding the great.

What are needed most by the profession at the present day are some reliable tests for the general condition of drinking-water, that are accurate and easily employed. One of the requirements of every graduate from our medical colleges should be, that he is thoroughly competent to test the drinking-water of any community in which he may locate. He should be taught that in no way can he so surely reach success as by a thorough understanding of the laws of health, and teaching the same to the people among whom he may reside. If this should be done, thereby causing an intelligent profession to be actively alive to the trust reposed in it as the guardian of the public health, and existing supplementary to the State Board of Health, there would be every reason to believe that the time would arrive when a severe epidemic of any description would be a thing of the past; that typhoid fever, in comparison to what it now is, would grow small by degrees and beautifully less; that scarlatina and diphtheria, those twin gateways through which the King of Terrors has come in so often to steal away our little ones, would gradually close; that consumption, which is now reigning king of kings and prince of terrors among diseases in New England, and is nearly as secure in his citadel as ever, would eventually yield his fortress to the general weal of mankind. He is already hearing the far off cannonading that tells to the world that the source of his strength is being discovered; that bacteria and the foulness not taken up by the acute form of zymotic diseases are his food and drink;—and with this knowledge gained, we will, with true military strategy, cut off his supplies, and thus starve him into a surrender; and we shall yet see this proud monarch, before whom we have all felt so weak, lick the dust at our feet.

DIPHTHERIA IN NEW HAMPSHIRE IN 1735.

BY GEORGE W. PIERCE, M. D., WINCHESTER, N. H.

In Belknap's History of New Hampshire, vol. II, page 118, is to be found the following :

"About this time the country was visited with a new epidemic disease, which has obtained the name of the *throat distemper*. The general description of it is a swelled throat, with white or ash-colored specks, an efflorescence on the skin, great debility of the whole system, and a strong tendency to putridity. Its first appearance was in May, 1735, at Kingston in New Hampshire, an inland town situate on a low plain. The first person seized was a child, who died in three days. About a week after, in another family, at the distance of four miles, three children were successively attacked, who also died on the third day. It continued spreading gradually in that township through the summer, and of the first forty who had it none recovered. In August it began to make its appearance at Exeter, six miles north-eastward, and in September at Boston. On its first appearance in Boston * it was supposed to be nothing more than a common cold ; but when the report of the mortality in New Hampshire was received, and a young man from Exeter whose brother had died of it was seized (October, 1735), the house was shut and guarded, and a general alarm spread through the neighboring towns and colonies. Upon his death no infection was observed in that house or neighborhood ; but the dis-

* Dr. Douglass computes the number of persons who had the distemper in Boston at 4,000, of whom 114 died, which is one in 35. The whole number of inhabitants at that time was estimated at 16,000.—*Weekly News Letter*, April 29, 1736.

temper appeared in other places which had no communication with the sick. The physicians did not take the infection, nor convey it to their families nor their other patients. It was therefore concluded that it was not, like small-pox or the plague, communicable by infection from the sick or from clothes; and the physicians having, by desire of the selectmen, held a consultation, published their opinion that it proceeded entirely from 'some occult quality in the air' fifty miles southward, though it was October before it reached Chester, the nearest settlement on the west of Kingston. It continued its ravages through the succeeding winter and spring, and did not disappear till the end of the next summer.

"The most who died of this pestilence were children, and the distress which it occasioned was heightened to the most poignant degree. From three to six children were lost out of some families; several buried four in a day, and many lost their all. In some towns one in three, and in others one in four, of the sick were carried off. In the parish of Hampton Falls it raged most violently. Twenty families buried all their children. Twenty-seven persons were lost out of five families, and more than one sixth part of the inhabitants of that place died within thirteen months. In the whole province not less than one thousand persons, of whom above nine hundred were under twenty years of age, fell victims to this raging distemper.

"Since the settlement of this country such a mortality had not been known. It was observed that the distemper proved most fatal when plentiful evacuations, particularly when bleeding, were used, a great prostration of strength being an invariable symptom. The summer of 1735, when the sickness began, was unusually wet and cold, and the easterly wind greatly prevailed. But it was acknowledged to be not 'a creature of the seasons,' as it raged through every part of the year. Its extent is said to have been 'from Pemaquid to Carolina,' but with what virulence it raged, or in what measure it proved fatal, to the southward of New England, does not appear.

"The same distemper has made its appearance at various times since. In 1754 and 1755 it produced a great mortality in several parts of New Hampshire and the neighboring parts of Massachusetts. Since that time it has either put on a milder

form, or the physicians have become better acquainted with it. The last time of its general spreading was in 1784, 5, 6, and 7. It was first seen at Sanford in the county of York, and thence diffused itself very slowly through most of the towns of New England, but its virulence and the mortality which it caused were comparatively inconsiderable. 'Its remote or predisposing cause is one of those mysteries in nature which baffle human inquiry.'

"The following table, drawn from an account published by Mr. Fitch, minister of Portsmouth, July 26, 1736, is a bill of mortality for fourteen months preceding :

TOWNS.	Under 10.	Between 10 and 20.	Above 20.	Above 30.	Above 40.	Above 90.	Total.
Portsmouth.....	81	15	1	.....	2	.....	99
Dover.....	77	8	3	.....	.....	.....	88
Hampton.....	37	8	8	1	.....	1	55
Hampton Falls.....	160	40	9	1	.....	.....	210
Exeter.....	105	18	4	.....	.....	.....	127
New Castle.....	11	.....	.....	.....	.....	.....	11
Gosport.....	34	2	.....	.....	1	.....	37
Rye.....	34	10	.....	.....	.....	.....	44
Greenland.....	13	2	3	.....	.....	.....	18
Newington.....	16	5	.....	.....	.....	.....	21
Newmarket.....	20	1	.....	1	.....	.....	22
Stratham.....	18	.....	.....	.....	.....	.....	18
Kingston.....	96	15	1	1	.....	.....	113
Durham.....	79	15	6	.....	.....	.....	100
Chester.....	21	.....	.....	.....	.....	.....	21
	802	139	35	4	3	1	984

"After this account was taken, several other children died of the throat distemper; in the town of Hampton thirteen more within the year 1736,—so that the whole number must have exceeded a thousand. In the town of Kittery in the county of York died one hundred and twenty-two.

"It appears, also, from the church records of Hampton that

from January, 1754, to July, 1755, fifty-one persons died of the same distemper in that town."

It would seem from the foregoing account that the "throat distemper" of New Hampshire of the year 1735, and later, must have been identical with the diphtheria of to-day, every manifestation described being such as we now frequently witness in the progress of this disease.

SANITARY CONTROL OF THE FOOD SUPPLY.*

BY WILLIAM K. NEWTON, M. D., HEALTH OFFICER OF PATERSON,
NEW JERSEY.

There is no one subject more intimately connected with our every-day life, and about which so much has been written and published the past few years, as the condition of our food supply. The columns of medical, sanitary, and chemical journals, and the reports of state and local boards of health, have been crowded with essays on food adulteration and plans for checking it; and the popular papers have teemed with the horrors of the subject, each trying to vie with the other in furnishing the latest meal of adulterated articles, till, if we believe the sensational stories of these alarmists, we wonder why there are any people left to tell the tale.

It may seem unnecessary, or even presumptuous, then, for me to offer any remarks on this topic, and a less hackneyed theme might appear to be more profitable; but it is my aim to review the work that has been done in the way of investigating and regulating the food supply, and to draw attention to some novel phases of the question.

My purpose is to look at the relations of boards of health to the food supply, and I shall endeavor to trace out just where these relations begin and end; and I shall show, by the evidence so far offered, that a line may be closely drawn between harmless adulterations and those which are injurious to the public health. Your attention will be called finally to a class of foods

* Read at the last meeting of the American Public Health Association. Published by permission of the author.

of animal origin which need constant supervision on the part of our sanitary authorities.

It will be well at first to notice the regulations in force which aim to check adulteration, or to prevent the sale of injurious articles of food.

In Germany, Austria, France, and other European countries, laws have long been in existence controlling the manufacture or sale of articles of food. These laws are either general, or are merely local police regulations. There is hardly a city or municipality on the continent which does not more or less efficiently look after the quality of foods, and endeavor to insure purity.

It would extend the length of this article beyond reasonable limits to mention the custom in each country; and the forms of government are so different from ours, that they would not be applicable here. We can derive more benefit by following the efforts made in English speaking countries.

ENGLAND.

The first attempt made in England in modern times to enact laws bearing on adulteration was in 1860 (23 and 24 Vict., c. 84), but a comprehensive law was not passed till 1872 (35 and 36 Vict., c. 74). The statute now in force became a law in 1875 (38 and 39 Vict., c. 63), and was further modified in 1879. It is upon these recent English laws that those now in force in the United States were based.

The general plan followed in Great Britain is as follows:

Public analysts are appointed by each parish, borough, or town government, and are required to analyze a number of samples as fixed upon each year, for which a stated sum of money is paid. Thus, an analyst in a certain rural district is required to analyze a stated number of samples of milk, bread, spices, and so on, and either a lump sum is paid for the work, or the price for each article is fixed upon. This plan limits the amount of work expected of each man.

Inspectors of nuisances, appointed in the same manner as the analysts, are required to collect the samples, and if the certificate of the analyst states that they are adulterated or sold in violation of the food adulteration law, the inspectors shall make complaint before a magistrate, who tries the case.

A portion of the sample is always reserved, and, in case of appeal from the decision of the analyst, is sent to the chemists at Somerset House.

It will be seen by this outline that the amount of work done depends altogether on the local government. If that body be penurious, or lacking in sympathy with the work, little can be accomplished. Hence a great drawback to this system lies in the method of regulating the amount of work required of the analyst. If that official was paid a stated salary, and should analyze all samples left with him, more headway would be made; but for reasons of economy the other plan is followed.

The appointment of an analyst is made obligatory on the local government; but while these appointments are made in every case, in many instances no work is given them to do. In 1882 three counties and forty-two towns did no work under the act whatever.

For these reasons the results attained under the law, which will be noted further on, do not accurately represent the condition of the food supply of all parts of Great Britain.

Besides this food adulteration law, there are other acts of a very salutary character in force: among these may be mentioned the bake-house acts, slaughtering acts, and acts relating to dairies.

CANADA.

In Canada a law was enacted January 1, 1875, but work was not begun till 1876. As there are peculiar, and what appears to the writer desirable, features in this law, a somewhat detailed description will be given of the methods employed under it.

The law is moulded after the English laws, but the machinery for its enforcement is different. The latter is under the charge of the Department of Inland Revenue, a branch of government analogous to our Internal Revenue Department. This department has the supervision of inspectors and analysts, and collects the revenue on liquors and other articles. The department has control not only over manufacturers and compounders of liquors, but is brought into intimate relations with all branches of trade. This is of great advantage, for, as will be seen later on, articles used for the purpose of adulteration are very rarely injurious to health, but are added to foods in order to cheapen or defraud;

hence the adulteration laws are trade and not public health measures, and should be under the charge of some department of government other than health boards. This opinion seems to obtain in Canada, for the law is treated as a commercial one, and is not considered from a sanitary stand-point.

To return to the method of management:

The governor appoints one or more analysts for each revenue district. At present there are six, one for each of the following cities and districts: Halifax, Montreal, Quebec, Toronto, St. John's, and London. The officers of inland revenue, the inspectors of weights and measures, and the inspectors of foods, are authorized to procure and submit to the analysts samples of food and drugs, and upon receiving a certificate from the latter official stating that the article in question is adulterated, the inspector is authorized to seize and destroy it. This latter penalty, however, is rarely enforced. The expenses of analyses in case of prosecution are added to the costs, and are paid by the convicted person; but in case no prosecution is made, the costs are paid by the government.

There have been very few prosecutions, the department depending on the publication of the name of the culprit as a form of punishment.

The analysts are paid by a retaining fee of \$200 per annum, an allowance for the first year for laboratory apparatus of a sum not exceeding \$300, by an allowance of \$100 for rent, and by payments of fees until the total amount shall have reached the sum of \$2,000 per annum. The fees allowed are reasonable. The commissioner of inland revenue apportions each year the amount of work expected of each analyst.

I ask you to bear this outline in mind, for we shall show that the results attained under this system have been very encouraging.

UNITED STATES.

In our own country many states have had for many years scattered clauses in their statutes relating to the adulteration of foods, and prohibiting the sale of dangerous meats, etc. Thus, the older states of Massachusetts, New York, New Jersey, and others, had laws forbidding the sale of adulterated foods, milk, medicines, liquors, and unwholesome provisions. Nearly every

state has a purely commercial system for inspection of flour, bacon, lard, salt, etc., but these restrictions apply only to weight and other trade qualities.

It was not until 1879 that any attempt was made to propose a carefully prepared law applicable to each state. It had long been known to merchants that the frequent adulterations of food were not only injuring trade, but were damaging the credit of the dealers. Hence in that year a prize of \$1,000 was offered by the National Board of Trade for the best essay on adulteration, and for the best form of a law prohibiting the same. As a result of this contest a law was drawn up by careful and competent men, and attempts were made to have it enacted in the various states. This has been successful in but three states.

The law recommended by the committee of the Board of Trade was adopted by the legislature of New Jersey on March 25, 1881; by the New York legislature later in the same year; and was passed in Massachusetts, with slight modifications, in 1882.

A copy of the law, changed so as to be applicable to the territories and other sections of the country under the charge of the general government, was presented to the last congress, but, not receiving the support it was entitled to, failed to pass. A law prohibiting the importation of damaged and adulterated tea was enacted, however, and much good has been accomplished under its provisions.

A brief outline of the state law may be of interest, as parts of it are uniform in New Jersey, New York, and Massachusetts. It begins by defining what is meant by adulteration in the case of food or drugs; gives the state boards of health power to exempt from time to time certain articles, and also exempt certain mixtures or compounds recognized as ordinary articles of food, "provided the same are not injurious to health." The act further requires that the State Board of Health "shall take cognizance of the interests of the public health as it relates to the sale of food and drugs and the adulteration of the same, and make all necessary investigations and inquiries thereto." The board is also to appoint analysts and inspectors.

Each state has adopted rules and methods of procedure peculiarly its own. These we shall now notice.

NEW YORK.

In New York \$10,000 was appropriated in 1881 for the work of investigation. In 1883 \$30,000 was voted by the legislature for the purposes of the law, but this was stricken from the budget by the governor; hence the work of the board has been very much crippled.

In 1881 nine analysts and four inspectors were appointed to carry out a system of investigation. An immense amount of work was done, and a series of exceedingly valuable reports was presented to the board by this corps. These reports will be referred to later on.

As to the actual prosecution of dealers in adulterated foods, very little has been done. A few complaints have been made in cases of the sale of impure cream of tartar, and varying results obtained, some of the cases being taken to the higher courts. An important suit against importers of damaged and adulterated tea is now in the courts, and at present writing remains undecided.

NEW JERSEY.

In New Jersey \$600 was appropriated by the legislature in 1881 for the purposes of the act. Six analysts were appointed by the State Board of Health, to report on the condition of the food supply in the state, which was done, and the results printed in the fifth annual report of that board.

In 1882 the legislature failed to make any appropriation, and little or no work was done in that year. In 1883 the law was very much changed, and an annual fund of \$1,000 provided for. Four analysts were then appointed, and are prepared to analyze all samples sent to them.

The legal proceedings were altered to conform to the general public health law of the state, and to provide for summary trials without a jury. Authority was given to any analyst or inspector, or any officer of a local board of health, to inspect articles of food wherever exposed for sale; and if, upon inspection, an article shall prove to be adulterated, the officer is empowered to prohibit the sale or disposal thereof till decision shall be given by the court before which the defendant may be brought. This provision has been adversely criticised, but the reason for its

existence is patent to any person conversant with the principles of sanitary law. If an article is injurious to health, its sale should be prohibited, and the health officer should be empowered to prevent the use of such food; for, if one has to await the results of a trial, in many cases very protracted, the very object of a public health measure is defeated, and the offender not punished until great harm has been done. This principle is upheld by another law in New Jersey (the milk adulteration law), which will be discussed further on. In that law the inspector is authorized to destroy impure milk wherever found, and thus prevent any harm to the public health by such a dangerous article of food. The only prosecutions under the food law in New Jersey were against dealers in impure milk at Newark, but as no decision has been given by the higher courts, little can be said as to its strength.

MASSACHUSETTS.

The State Board of Health in this state has appointed two analysts,—one at a salary of \$1,500, and the other at \$1,000 per annum. The first has charge of the investigation of articles of food, the latter of drugs. No provision has been made for inspectors, but the analysts have to obtain the samples themselves. The analysts are not only to investigate the condition of the food supply, but are to designate such articles as shall be exempt from the action of the law, and also to fix standards of purity for future use. No reports of the investigations have been so far published.*

As to the value of these laws, and whether they will withstand the assaults of acute lawyers retained by rich defendants, little can be said, for no real test has been had; for only a few cases have been tried in the petty courts of New York and New Jersey, and the law points have not been argued before the higher courts.

As to the form of the laws, it is held by so eminent an authority as Dr. E. R. Squibb, that in "aiming to be concise, compact, and brief, they are too general and too loose for any very clear comprehension by the adulterators, to whom they are really addressed. The law seems to address itself to the ana-

* Since this was written, prosecution has been begun, in Boston, in cases of milk adulteration.

lysts, lawyers, and courts, and generalities leave too much room for protracted legal proceedings and technicalities, all of which involve well known chances of escape for defendants.”*

Another point: This law, on its very face, bears the stamp of being a trade measure; and it is not until we reach the clause where it states that state boards of health “shall take cognizance of the public health in so much as relates to injurious foods,” that we know the sanitary bearings of the statute. In truth, if health boards are to take cognizance of adulteration only when it affects public health, the problem would be very easy of solution, and sanitary authorities would be rid of many duties that are thrust upon them, and not properly belonging to their sphere. But as interesting as this discussion is, we must leave it for the present.

SPECIAL LAWS.

A few states have special laws bearing on this subject. Thus, New York has a law intended to compel dealers to sell oleomargarine and lard cheese for what they really are, but it has never been enforced. Massachusetts has a statute authorizing cities and towns to appoint milk inspectors, and prohibiting the adulteration of milk. Boston is the only city working under it, and more or less efficient work has been done.

Last year, 1882, the vinegar makers of that state came to the conclusion that their trade needed protection from adulterators, so they were presented with a law regulating the sale of vinegar, forbidding the addition of any foreign acid, and authorizing the appointment of inspectors of vinegar. The inspector of vinegar for Boston has been working up the subject, and regrets the “deficiently drawn statute.” He has done much to enlighten us as to what vinegar is, and what are its adulterants.

Rhode Island also impowers cities to appoint milk inspectors, and forbids the sale of impure or impoverished milk. The city of Providence has done excellent work under this law, and has reduced the sale of impure milk to a minimum.

New Jersey has given her people protection against adulterated honey, lard, liquors, and milk, but no one ever knew a person to be prosecuted for selling either of the three first men-

* *Ephemeris*, No. 1, p. 24.

tioned articles. An active warfare has been waged, however, for the past four years, under the milk law, and as it has some novel features it will bear review. This law was originally drawn up as a purely commercial measure, for the purpose of enabling honest farmers and dealers to sell a pure article, and also to protect them from the evil practices of creameries and other adulterators. Provision was made in this law for the appointment of an inspector of milk for the whole state, but the honest farmers did not know whom to trust with the appointment. They could not depend on the politicians, for the office would then become one of the spoils of party; so in their adversity they bethought them of the State Board of Health, when, presto, the commercial law was transformed into a public health measure, and the bantling was turned over to the care of that board. And it has proved a public health measure in fact, and clearly defines what pure milk is.

I will mention a few of the principal points in the law: Milk from which the cream has been removed can only be sold from cans marked in letters two inches high "Skimmed Milk." The sale of adulterated, impure, or unwholesome milk, or the milk from cows kept in a crowded or unwholesome condition, or diseased, or fed on unwholesome food, or upon distillery waste or other rotten substance, is forbidden. The addition of water or any other substance is declared an adulteration. Milk which has been exposed to or is contaminated by the exhalation from any person sick with any contagious disease shall not be sold. For the purposes of this act, milk shall be considered as adulterated when it shall contain less than 12 per cent. of milk solids.

Cases of violation are tried before a court in a summary way, without a jury, and a certificate of an analyst that the milk did not conform to the state standard is sufficient evidence. Under this act, the State Board of Health appoints annually a state inspector of milk, who has power to appoint assistants, and also to inspect milk wherever found, and if it is adulterated or impure he is authorized to destroy it. The state has expended from \$1,000 to \$1,500 a year on this special work.

Besides these general and special laws, there are many local ordinances or sanitary codes which govern and provide for the work of inspection in the larger cities. Nearly all of our cities

make some provision for market inspection, but in most instances the very flagrant violations of law, such as the sale of bad meat and stale vegetables, only are dealt with. In some cities,—New York, Brooklyn, Cleveland, Cincinnati, and others,—the milk inspection is carried on in a very vigorous manner. Thus, in New York city, the warfare carried on during the past few years against impure milk has done incalculable good.

It will be interesting now to review these laws, and note the method of enforcement employed.

In France, the work appears to be done by the police officers of the various cities.

In England, the parish, town, or municipal boards have control, and appoint the officers. These boards are not comparable with our boards of health, as is sometimes supposed, but they are analogous to our borough, town, or village governing bodies. They not only have charge of sanitary matters, but care for the paupers, disburse alms, lay out streets, etc.

Canada places the control of the adulteration laws in the hands of the Inland Revenue Department, a branch of government brought into intimate relations with trade, and hence in a position to know the rules and requirements of trade.

In the United States we have departed from all beaten tracks, and have turned over to state and local boards of health all adulteration laws so far enacted. This has been done for two reasons,—first, because there is no other department of government to which these laws could very well be directed; and, secondly, because a few articles of food are so adulterated as to be injurious to health or life, it is argued that all sophistications are dangerous. This assignment of a duty not distinctively and positively applicable to health boards is unfortunate, for these boards have even more than they can do now, with the things which properly belong to them. And from a multiplicity of duties thrust on us, we are apt to neglect some matters of greater importance to the public health and weal.

I will not deny that there are articles of food which need the constant watch-care of sanitary officials, but they are few in number, and are mostly of animal origin. Of these I shall speak later on.

I am again tempted to quote from Dr. E. R. Squibb. He has

devoted years of his life to the fight against adulteration in all its forms, and his mature opinion is well worthy of our consideration.

He says that the objects of the adulteration laws are as follows: "First, to deter persons from practices of adulteration; second, to detect such practices; and, third, to punish them. All these combine to prevent adulterations. But the first is by far the most important element, and that which requires greatest emphasis, because it is the most radical in its influence and most economical in its effects. The motive power of all adulteration is pecuniary profit or gain, and not to endanger or damage health at all. And that adulterations do endanger health is a mere accident, that most adulterators strive to avoid by rendering their adulterations as harmless as possible. Therefore it is that all adulterations are mere dilutions and substitutions in the interest of pecuniary profit or gain, and if they are ever positively hurtful, it is by accident and not by design; and hence adulterations are simply frauds, cheats, or deceptions to make money by, and they are studied out and designed in this one single interest before they are put into practice. Now, when a law can come in effectively between the motive and the act, to deter from the act, it is then nearly perfect, since there is nothing then to detect or punish, nor any work for the analysts or the courts at all, no expense to the governments, and therefore no taxes upon the people for enforcing the law, to say nothing of the moral effects of restraining from vicious practices." He then says that if the law is to be operative between the motive and the design, it should be drawn in full and plain language. "If the penalty be sufficient, and sufficiently sure to make the risk of punishment greater than the profit will warrant, the design to adulterate will be abandoned, and the law will have its natural and wholesome success."*

Whether the laws that we have reviewed will come up to Dr. Squibb's standard I leave you to judge.

I am afraid that we place too much trust in laws themselves. Some people with whom I have talked on this subject seem to labor under the delusion that the moment a law is placed on the statute-books a moral revolution takes place, and that the end

* *Ephemeris*, No. 1, p. 24.

sought for would be attained without more trouble. I once had great faith in laws myself, and believed that because a certain law, calculated to do great good, and in itself a beneficent measure, said so, and so must be the case, that all the courts and lawyers would bow to its dictum. But one hour on the witness stand, and two hours of talk from the lawyer on the other side of the case, dispelled the delusion, and I came to the conclusion that there was no such a thing as justice any more.

With this experience in mind, I would say that the only way to prove the value of our food laws is to enforce them vigorously, and if they come out of the fiery ordeal of the courts unscathed we shall be extremely fortunate.

We will agree that there is a necessity for laws such as these to forbid adulteration, and whether trade or public health is paramount they should be enforced without fear or favor; and if it is deemed the duty of health boards to execute them, let us bow to the demand, and do the best we can.

RESULTS OBTAINED.

Now that we have glanced at the various laws, and the machinery employed to enforce them, let us see what has been accomplished by investigation and prosecution. Let us look over the field, and see if we can discover what articles are adulterated, and what is the character of the adulteration. Has the vast expenditure of money and time revealed anything, or has it all been spent for naught? If it be proved that our food supply is not harmfully adulterated, or if we can draw the line between sophistications which touch only the pocket and those which endanger health and life, we must acknowledge that the thousands of dollars spent in the work have not been wasted, but have given us ample returns for the investment. The amount of evidence bearing on food adulteration at our command to-day is enormous: the great difficulty with which we have to contend is to properly use it. But we shall endeavor to present it unbiased and unprejudiced.

First, let us see what is the prevalence and what the proportion of adulterated food, and then note the effect of prosecution and investigation thereon.

As to continental Europe we can say but little, for the records

are so scattered and the laws so multifarious that we have but a trifle to offer. In France, to judge from the published reports, chemists note articles as good, bad, passable, not injurious, and injurious. Thus, in March, 1883, out of 1,118 articles examined at the Paris laboratory, 271 were returned as good, 231 as passable, 616 as bad, 545 of which are "not injurious," and 71 "injurious." It is difficult to tell just what is meant by these terms, and as we are not informed which are pure and which adulterated, no opinion can be formed. Wines form by far the largest number of articles examined, and from the report we judge that the Parisian gets very little pure wine. Of 257 samples of milk, 26 are returned as good, 116 as passable, and 115 as bad, but not injurious.

GREAT BRITAIN.

Year.	Number analyzed.	Per cent. adulterated.
1875-6	15,989	18.10
1877	11,943	17.70
1878	15,107	16.58
1879	17,574	17.25
1880	17,919	17.47
1881	17,868	16.56
1882	14,900	16.50

These totals do not represent foods exclusively, for drugs, wines, spirits, and beer are included; nor do they indicate the state of the food for the whole of Great Britain, for, as before stated, in many parts of the country no work is done under the act.

It will be seen, by glancing at the figures, that five years' work, from 1877 to 1882, has only reduced the amount of adulteration 1.2 per cent. When it is remembered that a vigorous prosecution has been kept up, we are compelled to acknowledge that the results are not very encouraging.

Selecting a few articles from the list for purposes of comparison, we find that of the samples of milk analyzed the per cent. adulterated varied from 26 in 1877 to 20.35 in 1882; butter, including oleomargarine sold for butter, 12 to 15 per cent.; groceries, 13 to 10 per cent.; bread and flour, 6.84 to 4.32 per cent.

CANADA.

Canada shows by far the best results obtained by any country, and the reduction in the amount of adulteration has been made by but little prosecution. The only form of punishment indulged in is the publication of the names of the dealers in impure articles. In 1876, when the work was begun, 51.66 per cent. of the articles examined were adulterated. In 1882 this figure is reduced to 25.66, showing an improvement of a little over 25 per cent.

UNITED STATES.

As there has been little or no prosecution in the United States under the food laws, but little has been done in the way of a reduction of the percentage of adulteration. In New York and other cities, and in New Jersey, the sale of impure milk has been reduced markedly; but there is still much work to do.

If we look over the reports of the analysts of New York, New Jersey, Massachusetts, Michigan, and other states, we obtain a fair idea of the prevalence of sophistication in this country. We find that the staple articles, such as are found in the average household, suffer adulteration about as follows: Spices and condiments, 66 per cent.; ground coffee, 45 per cent.; tea, 48 per cent.; sugar, the higher grades rarely, the lower grades 20 per cent.; syrup, 50 per cent.; milk, when not inspected, 50 per cent.; flour, none; bread, about 2 per cent.; cream of tartar and baking powders, 44 per cent.; butter, 40 per cent. (other fats substituted); vinegar, rarely adulterated, but rarely cider vinegar; olive oil, 60 per cent.

CHARACTER OF ADULTERANTS EMPLOYED.

Spices and condiments, adulterated with exhausted spices, ground cereals, flour, buckwheat hulls.

Coffee, with chicory, rye, and other cereals.

Tea, with exhausted leaves, leaves of other plants, damaged teas, coated to improve looks.

Sugar, with grape sugar.

Syrup, with grape sugar—in many cases all glucose.

Milk, with water, alkaline salts to neutralize acidity, preservatives, and is often skimmed.

Bread, alum added to increase whiteness,—rarely used in this country.

Cream of tartar and baking powders, gypsum, starches, and “fillers,” to increase bulk.

Butter, other fats substituted for it or adulterated with foreign fats.

Vinegar, rarely adulterated, but often not fruit vinegar.

Olive oil, peanut and cotton-seed oil.

It will be noted, after glancing over this list, that the staple articles in every-day use are never adulterated with injurious substances; and the evidence thus far offered indorses the statement made in the first part of this paper, that adulteration is a sin against the pocket, and extremely rarely against health.

A group of substances which may be classed together, and, strictly speaking, not adulterations, but which are often used for the purpose of sophistication, will now be considered.

OLEOMARGARINE.

It is difficult to say whether this may be put in the category of articles to be placed under the watch-care of sanitary officers. Some have held that there is danger of animal parasites or diseases being introduced into the economy by the use of this article, but the best authorities deny this statement. Personally, I am of the opinion that it should be classed with the commercial frauds, but that its manufacture should be watched carefully by health officers. You are so familiar with the process of manufacture that it does not seem necessary for me to go into detail. Suffice it to say, that as the aim of the maker is to produce a sweet and merchantable commodity, any rancidity would interfere with its sale. This fact insures the public against any putrid or ill-smelling fat being used.

The quantity of this material sold and used as food in the United States is enormous. We may form an idea of the extent of the business when we know that three factories in New York state turn out not less than 4,500 tons a year, and there are some five or six more factories in the country. I venture to assert that a very small portion of this is sold to the consumer for what it really is.

We must recognize the necessity of some legal control over

this trade, and dealers should be compelled to sell the article on its merits, and not fraudulently. The enforcement of such a law does not belong to health boards, however.

“LARD CHEESE” AND “LARDINE.”

An ingenious New Yorker has discovered that he can take milk robbed of its cream, and by the introduction of a foreign fat produce a cheese equal to an honest cream cheese. Lard and oleomargarine oil have been used in this process, and the resulting material is known as “lard cheese.”

“Lardine” is an artificial butter made in nearly the same way.

Now if these articles were sold to the public on their true merits, no one would complain; but such is rarely the case, and if persons will insist on being thus defrauded, it may be argued that legal protection to the innocent purchaser is demanded.

GLUCOSE.—GRAPE SUGAR.

It is estimated that ten pounds of glucose *per capita* is made and sold each year in the United States; and we naturally ask, What becomes of it? No one ever heard of a person asking for the substance at a grocery store; yet it is sold and consumed somewhere. We can account for a large percentage of the substance in the syrups, strained honey, confections, and in the lower grades of sugar.

Attempts have been made to check or prohibit the sale of this article, which, as Dr. Squibb has it, “marks the progress of the age.” The legislators of New Jersey passed a law in 1881 requiring that the manufacturers of sugar and syrup, who shall mix therewith any glucose or grape sugar, must mark the package with the word “adulterated,” under a penalty of \$500. This law came before Governor Ludlow for his signature, which he refused to affix. His veto message will bear quoting here, for it answers the question as to whether the substance shall be considered injurious or not. He says,—“The manufacture of glucose, or corn-sugar, is an enterprise yet in its infancy; it will, if successful, result in the utilization of the corn crop of the country, the increase of the sugar supply, and the conse-

quent employment of a large amount of capital and labor. Scientists of acknowledged ability and integrity have declared it to be a healthful article of food, and there is no reason why the result of its mixture with cane sugar should be marked 'adulterated,' as if it were a debasement or pollution." The legislature was satisfied with the governor's explanation, and did not enact the law.

Frequent statements have been made that sulphuric acid has been found in large and poisonous quantities in the glucose syrups. This is either a perversion of facts, or an exaggeration. It is true that sulphuric acid is employed in the conversion of starch into grape sugar, but the acid is afterwards neutralized by means of milk of lime. If any acid exists in the syrup, it is either in combination with the lime, or free and in very small quantities,—a condition strenuously avoided by the manufacturers.

It may be said, without fear of contradiction, that glucose may be considered a harmless article of food. As to the use of this article as an adulterant, I hold that it does not come under the jurisdiction of health officers.

CANNED FOODS.

There is sufficient evidence to warrant us in asserting that fruits, vegetables, and meats preserved in tin need our attention. Many cases of acute poisoning, of greater or less severity, have been reported by competent observers.

It has been proved that some fruits and vegetables act upon the tin or lead, and enough of these metals is dissolved to cause serious illness. This is especially true of the very acid fruits, such as apples, cherries, and vegetables like tomatoes.

One case has come under my notice, where two persons were seized with an attack of vomiting, purging, and cramps, after the ingestion of apples preserved in tin. I was fortunate enough to obtain the can and the remainder of the fruit. The interior of the can presented a crystalline appearance, such as is described by Wood and others who have investigated the subject. The fruit was acid in reaction, and analysis revealed tin in considerable quantities.

It has been suggested that only old and imperfectly prepared

fruits and vegetables cause trouble, and that to ensure the freshness of the article the year of canning should be stamped on the package. This subject needs thorough investigation.

As to illness being caused by canned corned beef and other meats, I can say that I have seen two cases, but the trouble seemed to be due to imperfect preservation, as the meat in both cases was partially rotten. Both cans were what is known in the trade as "swelled-head," that is, the ends were bulged out by air or gases in the can: hence these cases cannot be cited as being caused by canned meats by themselves.

PRESERVATIVES.

I wish to call attention to the use of preservatives, as the custom seems to be increasing. The subject should be thoroughly studied before a competent opinion can be formed as to the advisability of their employment. Those which I have examined have consisted of salicylic acid, either alone, or combined with soda, alkaline carbonates, potassium nitrate, and borax or boric acid. These are extensively advertised in glowing language, and with the usual accompanying certificates from chemists or physicians, and meet with ready sale. Many fanciful names are given to the compounds, and each is claimed to be "positively harmless."

My own opinion is, that their use should be discountenanced by sanitarians; for the mere fact that a certain chemical combination will check fermentation or putrefaction outside of the body leads us to believe that digestion will be impaired or impeded. This I have sought to prove in an imperfect way, by treating milk with a preservative, and then attempting artificial digestion. Digestion was proved to be interfered with, or checked altogether.

Thus far we have been discussing certain laws and duties relating to the food supply with which health boards may or may not properly concern themselves. Your attention is now called to a group of foods, and the trades connected therewith, which need the constant surveillance of sanitary officers. I refer to bread, milk, and meat, and the trades of baker, milk seller, and butcher, each one of which should receive the closest

attention of health officers. The importance of this branch of our subject is so evident that I shall go somewhat into detail in pointing out the line of investigation necessary.

BREAD.

The amount of adulterated bread sold in the United States is very small, certainly not one per cent. of the total quantity used. Alum is sometimes used to make bread appear white, but it is not a common practice. It may by prolonged use cause indigestion, and of course its use should be checked. But the health officers' duties do not end with the mere examination of bread for alum: he should carry on his inspection further, and into the bake shop, noticing the condition and surroundings of the place, and insist that there should be cleanliness in every branch of the business.

Bake-shops are generally located in cellars, and are very often damp, dirty, and foul-smelling, and if a person with a sensitive stomach should visit many of them, I am of the opinion that the demand for home-made bread would be increased. The very occupation of baker is apt to cause certain diseases of the skin of the hands, and although no illness may be caused by it, it is not pleasant to think of our bread containing the scales or scabs from eczema.

To give a leaf from the history of a few visits to bake-houses may interest you, and impress upon your minds the importance of the sanitary control of such places.

Most of the places visited were in damp, dark cellars, where artificial light is constantly used. In one place we find the cat and dog asleep in the kneading-trough, fowls running around and perching on the various utensils, and a general air of filth and lack of thrift. In one shop the kneading-trough was connected with the sewer by means of an untrapped waste pipe. In another the soil pipe had burst, and the floor was flooded with liquid filth. The baker said that "that always happened after a rain-storm." I have seen a baker mixing his bread with hand and arm covered with the eruption of eczema. He said that "the doctor told him the dough was good for the disease." But he would say that the quality of the bread was not improved thereby.

The custom of using bake-shops for sleeping-rooms is very common, and must be discountenanced.

I would insist, then, on the necessity of frequent inspections of bake-houses, in order that cleanliness should be insured.

MILK.

When we consider that milk is universally used, and that it constitutes almost exclusively the diet of children at that time of life when they are least able to resist any interference with the purity of their food, we are forced to the conclusion that strict measures should be adopted by every health authority to insure that condition of the supply necessary for good health. It is pleasant and encouraging to know that this is acknowledged by most sanitary officers, and that more or less efficient work is done by a great number of health boards to check the sale of impure milk.

But the mere inspection of milk for the purpose of detecting adulteration, although most commendable, does not go far enough, and is not in itself sufficient. The watchfulness of health officers should go much further, and should extend to the dairies from which the supply may come. This I shall insist on, and shall state cogent reasons for demanding it.

We are in a position to assert that the adulteration of milk is confined almost exclusively to the addition of water, preservatives, and alkalies, and to the abstraction of cream. These adulterants are not in themselves injurious to health; but when we know that the nutrition of an infant is seriously interfered with by the impoverishment of the milk given it, we see wherein harm may be done.

Besides checking the sale of adulterated and impoverished milk, the inspector should be on the lookout for milk from dangerous sources, some of which I shall now indicate.

Milk produced by improper feeding.—Distillery waste, and sometimes beer grains, produce a quality of milk of low nutritive powers, and dangerous to infants.

Colostrum.—The milk from cows soon after calving should not be sold. It has often produced intestinal troubles in children.

Cattle improperly cared for.—Cattle improperly housed and

cared for, especially those kept in cities, need close watching, and the stables should be frequently inspected.

Milk from diseased cattle.—Milk from diseased cows is especially dangerous, and we may assert that the use of this article from tuberculous cows is very hazardous. Sufficient evidence has been offered by good and careful authorities to prove that there is a possibility of the transmission of tuberculosis by means of the milk, and phthisis is quite a common disease among milch cows when crowded in ill-ventilated stables. Fortunately the secretion of milk is checked during many of the acute cattle diseases, but there is the risk of carelessness on the part of dairy-men; hence inspectors should always be on the alert.

Finally, there is the great danger of the transmission of contagious diseases, the milk acting as the carrier. This fact has been carefully noted in England, and many epidemics of typhoid fever, scarlet fever, and diphtheria have been traced to the dairyman's house.

Mr. Ernest Hart, of London, has epitomized about all that is known on this subject in an article read by him before the International Medical Congress in 1881. He sums up as follows:

The number of epidemics of typhoid fever recorded in the abstract as due to milk, is 50; of scarlatina, 15; of diphtheria, 7. The total number of cases occurring during the epidemics traced to the use of infected milk may be reckoned in round numbers as 3,500 of typhoid fever, 800 of scarlet fever, and 500 of diphtheria. When it is remembered that barely ten years ago we were utterly ignorant of milk's being a carrier of infection, and that consequently these epidemics have all occurred within one short decade, it will be seen how vitally important is the safe guarding of our milk supplies from contamination.

The last number of the *Lancet*, October, 1883 (No. 88, p. 652), records an epidemic of typhoid fever at St. Pancras, the details of the investigation being given by Mr. Murphy, Medical Officer. There were 431 cases in 276 houses, and 220 cases were traced back to a dairy which supplied most of the houses with milk.

We can easily account for the method of transmission in many cases. Thus, a can of milk—a fluid capable of absorbing all kinds of odors—may have been exposed to the emanations

from a case of scarlet fever, or the can wiped out with a soiled towel or cloth from the patient. The cases of typhoid fever traced to dairies have, as a rule, been accounted for by the contaminated water which has been used to dilute the milk or wash out the cans.

That the causes of the epidemics of some zymotic diseases have not been traced out in this country is probably due to want of care on the part of our sanitary officials.

I shall ask you now to consider a plan for a control of the milk supply, which I think should be followed by all sanitary officials. A registry of the milk dealers should be kept, backed up by law if necessary, and this should include the name of the dealer, the location of the farm, the amount of milk sold daily; and, after inspection of the farm and the milk, notes should be added as to the quality of the milk, the condition of the farmyards and the cattle, the breed of the herd, and the kind, quality, and quantity of feed given.

If this plan is followed out, it will not be long before a complete sanitary control can be kept over the milk supply. We are working on this plan in Paterson, but it is too early to arrive at results: so far it has worked well.

MEAT SUPPLY.

Most of our larger cities provide for meat inspection in their markets, but it begins and ends with the inspection of the meat actually exposed for sale, and as a rule only meagre, putrid, and immature meat is condemned. This system is defective in that it does not provide for the surveillance of slaughter-houses and the examination of all cattle before or immediately after killing, and before the meat is offered for sale.

In many of our cities the cattle are brought to the butcher by railroad, after a long journey: they arrive in an exhausted and feverish condition, frequently in a famished state, and are not fit to be used as food. In our smaller towns and villages only the very young or very old cattle are slaughtered for local use.

Not only are the cattle actually diseased at the time of killing, but the meat itself, by improper treatment, may act as a home for dangerous germs. Mr. Francis Vacher, of Birkenhead, in an able paper read before the International Medical

Congress, refers to several ways in which meat might spread diseases: thus, it might itself be in a pathological condition, or serve as a medium in which disease germs were nourished and multiplied, or it might serve as a nidus in which such germs rested. Thus, a specific disease may be communicated to man by the ingestion of meat tainted with splenic fever, or foot and mouth disease, or from a tuberculous animal.

We are warranted, then, in claiming that meat inspection should include an examination made by a competent person, before death or before the meat shall be exposed for sale in the markets. This plan may require the services of a skilled veterinarian, but it seems to me essential.

As many of our towns are now supplied almost entirely with meat killed and dressed in the West, and brought to market in refrigerator cars, this system of inspection will perhaps have to be followed by officials appointed by the general government, for it would not be equitable to burden a city with work which does not concern it.

HOMESTEAD AND SUBURBAN SEWERAGE.*

BY J. T. FANNING, C. E., MANCHESTER, N. H.

HOMESTALL HYGIENE.

The sciences have such distinctive local applications as to lead their devotees in devious directions,—as, for instance, mineralogical science is preëminently applied in excavations in the mountains, and guides the searchers to the richest mineral veins; hydraulic science finds applications in controlling and converting to useful effects the powers that rivers pass down toward the ocean; agricultural science assists the farmer in the fields to enhance his own and the national wealth by abundant harvests; nautical science makes the untracked ocean as a familiar highway.

We at the home fireside may have only a general interest in these special applications. The science of *public health* finds its local applications about all our households, and concerns the air we breathe from the first breath of morning, the foods we eat, the waters we drink, and the soils of our door-yards, and therefore is a science of universal and constantly renewing interest to humanity.

We have not necessarily to go into the mountains, the valleys, the broad fields, or to the great deep to study this science of the public health, but may with profit begin at our own tables with the simple morning repast, and at the richer feasts at mid-day.

DOMESTIC REFUSE.

Even the study of sewage, that may seem so abhorrent when seen only in the drains and pools, takes new interest if we begin to investigate its several natures that follow in succession from

* Copyrighted, 1884.

the time when it appears in the dining-room as rich broths, juicy steaks, baked fowl or game, as pastry, fruits, or sweet beverages. And perhaps there is no better starting-point than this to begin, if we would fully comprehend its nature.

The most offensive sewage usually results from what was or might have been the richest foods. The most delicious natural foods and the rankest growths of vegetation are those that tend to quickest spontaneous decompositions, and it is from such decompositions that the most offensive odors originate that make atmospheres seem pestilential.

The marvellously fine process by which Nature compounded animate growth until it became hearty meat, or vegetal growth until it became delicious fruit, is, when decomposition proceeds, being undone, and the meat and fruit constituents are resolving again into new organic compounds of a lower and grosser order.

From the refuse of the table and the drainings of the kitchen sink may be produced even more dangerous sewage than flows from the water-closet.

Grant to the table refuse and sink drainings the effects of a warm breeze and a little moisture during a few brief days, and they may then harbor and develop a deadly enemy. It is not the offensive stench that is the enemy, but the stench always gives warning that the enemy is already recruited, and that the time has already passed when his stronghold ought to have been removed to the fields, scattered and buried in the earth if possible, or transferred to a stream that would bear it away and destroy its deadly power. In suburban localities the table refuse and sink-drainings go too often on to the back surface of the yard, into a leaky tub to await convenient removal, or into a leaky cess-pool until a year's accumulations make removal a necessity. These methods, in summer, grant to the refuse the coveted warm air with moisture, and make the refuse a generator of dangerous disease, and, furthermore, lead to an over-saturation of the soil of the yard with organic ingredients, and surround the house with a perpetual destroyer of the health of the inmates.

POLLUTED SOILS.

Great prominence is given in hygienic discussions to the necessity of purity in the air we breathe and in the water we drink,

but the beneficial effects of these may be neutralized by a polluted soil on which we have built our homes. If the air is impure, natural forces are always at work tending to quickly replace it with a pure supply; but if the soil is polluted, natural forces can restore its purity only by slow processes. The processes within a polluted soil are chiefly, so far as relates to vision, microscopical in their nature, and escape the general observation, except as the suspicion of decomposition is aroused by the sense of smell; but there are analogous operations on a larger scale that may suggest to the general observer something of the nature of the microscopical processes.

If a fish or a dead animal is left exposed on the ground to a warm, moist air even for a few days, its structure undergoes a decomposing change, and its mass becomes the home and food and generative bed of numerous living creatures, visible to any one who by accident or otherwise goes within sight; and also undoubtedly the home of an innumerable throng of infinitesimal organisms, that may, at their proper stage, permeate the air in millions, unseen otherwise than as a slight haze. The relieved gases from the putrefying mass permeate the air, also unseen and unknown until their stench indicates their presence.

If ripe fruit is exposed on the ground to warm, moist air, a fungous growth is seen soon to envelop it, and the minute plant growths, discoverable only under the powerful microscope, may from this source also load the air with innumerable organic fragments.

Here we are to bear in mind the fact that putrefactive matter acts as a strong ferment, and induces rapid, special changes in the protean constituents of food, such as albumen, fibrine, casein, and in gelatinous tissues, mucus, &c.

We are aware that all animals and vegetables, so far as our observation extends, do, on the cessation of life, if exposed to warm air and moisture, soon reach the stage of putridity; and this is undoubtedly the case also with the myriads of microscopical organizations of both animate and vegetal origin whose brief spans cover but a few days, and in some instances but a few hours.

It is reasonable to suppose that the greatest danger from the myriad microscopical organisms that in a polluted atmosphere

freely enter our systems with each breath, and penetrate the lungs and even the blood, may produce most harmful effects after their life of brief duration has passed, and their decay proceeds.

We absorb, beneficially, animal and vegetable substances among larger, similar, though higher orders of organizations; as, for instance, among the crustaceans, fish, and plants, we freely eat and find nutritious the shrimp, crab, lobster, likewise the eel and bass, the water-cress, asparagus, and lettuce, provided they are submitted to the regular digestive fluids and organs. But other tissues of the body are not adapted to dispose of such organisms so quickly and safely as does the stomach, and no tissues of the body are adapted to dispose of organic matter in which the putrefactive action has begun.

If the soil is polluted with those substances, such as the meaty refuse, which develop animate organisms, then, other conditions being favorable, the surrounding air will soon abound with animate life; and if the soil is fouled with matters which favor the development of vegetal organisms, then the air may abound with vegetal life.

The *bacillus malaria* is claimed by the highest authorities to be an organism living in the air of the affected districts, and from the air it penetrates the human system, and ultimately affects the blood.

Observations of eminent hygienic authorities, such as Dr. Pettenkofer, Dr. Nageli, and Dr. Soyka, have established the fact that each special epidemic attacks vigorously only where certain polluted and humid conditions of soil predominate: hence the purity and dryness of the soil on which we build our houses are essential factors in ensuring safety and salubrity in those homes.

SUB-SOIL DRAINAGE.

An essential of a soil suitable for the reception of dwellings is, that its grade of saturation be maintained at a low level, and maintained as permanently unchanging as possible. Since moisture promotes the development of the organisms that thrive in the soil and its pollutions, especially the forms of minute fungi, sub-soil drainage is the first remedy tending to restore it to healthy condition, for drainage frees its pores, and admits dry

air to oxydize the impurities. Thus by thorough drainage, and the stirring up and aeration of the soil by tillage, probably even the malarial atmosphere may be prevented, so far as influenced



Fig. 1.

by the soils treated, and if the dampness is withdrawn from even an unpolluted soil, its tendency to induce pulmonary diseases is checked.

It is imperative that the cellars of dwellings be thoroughly drained, and if the soil beneath the cellars remains damp because of difficulty of under-drainage, the cellar walls should be laid in cement, and the cellar floors be laid of a material impervious to the moist air and to dampness.

Porous *tile drain-pipes* suitable for draining sub-soils of yards, are readily obtained of dealers, of calibres ranging from 1½" to 6", and these may gather the sub-soil waters into the sewer-pipes



Fig. 2.

with proper connections, at a distance from the dwellings. For various reasons sewer-pipes must be absolutely tight, and cannot therefore perform the functions of sub-soil drains.

EXCRETAL SEWAGE.

In addition to the kitchen refuse, the excreta and urine must be promptly removed before they have attained a condition of decomposition in which they menace the household health, which condition they reach even more quickly than dry refuse of the food ingredients. The dry garbage and ashes may daily go into compost with dry soil, or be mixed with the stable manures, when all conditions are favorable, and their manurial values thus be saved. The desirability is often urged, of thus saving excrementitious matters, as human foods are much richer than animal foods, and human excretions are correspondingly richer in ammonia and phosphates. Macaire and Marcet estimated one pound of human excrement to be equal to 13 pounds of horse-dung or 6 pounds of cow-dung, in fertilizing phosphates. Krepp, one of the most enthusiastic advocates of sewage utilization, collates from able authorities, and presents an estimate of the average quantity of fæces produced by an average individual to be

Solids, .232 pounds per day, or 1.34 cu. ft. per annum.

Fluids, 1.775 " " " " 10.39 " " " annum.

The four principally useful ingredients in excretal sewage, savable from an average individual, are estimated in annual amounts, as follows :

TABLE 1.

	Fæces. lbs.	Urine. lbs.	Total. lbs.
Ammonia (nitrogen).....	1.49	9.38	10.87
Phosphate of lime (phosphoric acid).....	2.00	2.80	4.80
Potash	0.25	1.08	1.33
Organic substances, &c.....	10.51	22.49	33.00
	14.25	35.75	50.00

The estimated value of this annual product is ten shillings sterling, or about two and one half dollars per individual,—not a large annual offset against physicians' services, loss of labor, and physical ailments that yearly result from dilatory attempts to utilize the sewage. The above estimate of manurial values is

based on the careful separation of the solid excrements from surplus liquids, by use of earth-closets, buckets, or other methods and deodorizations, and also daily hand removals by servants. In consequence of this separation, the sink-drainage, and sometimes the urine, are to be disposed of otherwise, as may be convenient. This seems to assume the shadow more frightful than the substance, for the sink liquids and urines are in fact the most troublesome matters of all the sewage, until a system of pipe sewers is provided.

SURFACE WATERS.

Then there are the roof waters and rain-falls upon portions of the yard to be promptly removed, which usually demands some system of underground drain-pipes for gathering the waters into the sub-soil drains; and this leads to a consideration of a studied system of drains for the homestead, and perhaps coöperative system of a neighborhood, or perhaps the broader co-operative sewerage system of an entire village, of which the homestead drainage is but a unit.

WATER CARRIAGE.

This disposal of sewage through pipes by water carriage demands a good supply of available water, and proper fixtures for its convenient and economical application.

The water carriage removal of sewage from homesteads, in accordance with the best modern practice, has not been surpassed by any other method of removal, in the elements of



Fig. 3.

safety for health, surety of automatic action, or convenience; but water sufficient for the action of the domestic apparatus, though increasing but slightly the amount required for daily household purposes, must be at hand in suitable tanks at all times, whether supplied from a private spring on the hillside, or a public water system delivers it under pressure, or whether pumped by power, or by hand, to the proper elevation within the homestead.

Water being provided, then, in addition to the usual fixtures of sinks, basins, baths, and water-closets, each properly trapped, there should be provided a *flushing slop-hopper* (Fig. 4), with grating, and trap, to receive the liquid slops of the household, and the kitchen sink should be provided with a proper *grease trap* (Figs. 5 and 6).

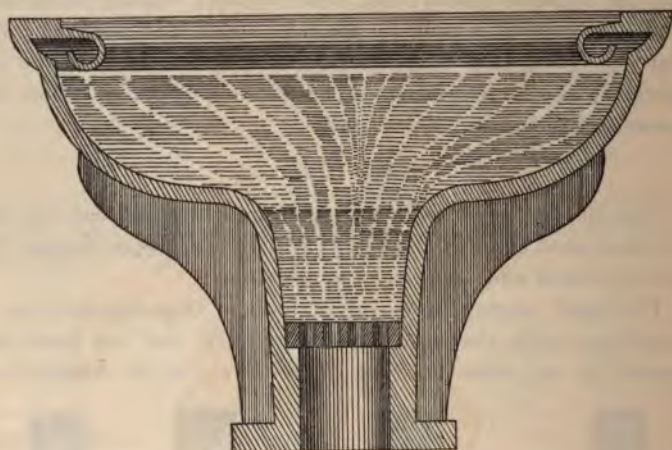


Fig. 4.—SLOP-HOPPER.

The severity of the northern winter weather adds some difficulties to the winter use of water-fixtures, where the dwellings are not constantly heated, as by furnace or steam, and proper precautions must be taken to protect the water-fixtures from frost.

The limit assigned to this paper does not permit the discussion of plumbing fixtures within the homestead, which have often been well discussed by others in publications readily accessible to all, but confines the discussion to considerations

touching upon the sewage delivered from those fixtures, and the storm waters upon the roofs and yards, and upon the pipes that will best convey them away.

VOLUME OF SEWAGE.

The amount of sewage produced by an ordinary family daily seems an insignificant matter, but its daily removal is always



Fig. 5.—INDEPENDENT GREASE TRAP.

an imperative duty. The daily amount of solid and fluid excretal sewage, stated in the above estimate, equals about .03 cubic foot per day per person, and where the family has a liberal water supply by pipes, the remaining house fluid sewage may be estimated, for a mean, as 3 cubic feet per day per person.

For computing the rain-fall on small areas, where the storm-

waters are admitted to the sewer pipes, the following table will give useful data :

TABLE 2.

VOLUMES OF RAIN-FALL FOR GIVEN DEPTHS OF RAIN.

Depths of Rain in 24 hours, in inches.	Total on one acre in cu. ft.	Cubic feet per sec. per acre.	Cubic feet per min. per sq. mile.
.05	182.5	.0021	80.67
.1	363.	.0042	161.33
.2	726.	.0084	322.67
.3	1089.	.0126	484.01
.4	1452.	.0168	645.33
.5	1815.	.0211	806.67
.6	2178.	.0252	968.00
.7	2541.	.0294	1122.73
.8	2904.	.0336	1290.67
.9	3267.	.0378	1450.00
1.0	3630.	.0420	1613.35

The following elementary data for pipe sewers, will also facilitate sewer computations.

TABLE 3.

ROUND PIPE SEWER ELEMENTS.

Diameter in inches.....	4"	6"	8"	10"	12"	14"	16"	18"
Diameter <i>d</i> in feet.....	.3333'	.5'	.6667'	.8333'	1'	1.167'	1.333'	1.5'
Sectional area <i>S</i> in sq. feet.....	.0878	.1963	.3490	.5454	.7854	1.069	1.397	1.767
Contour <i>C</i> in ft.....	1.047	1.571	2.094	2.618	3.142	3.665	4.189	4.713
Mean hydraulic radius..... $r = C \div S$	.0833	.1250	.1666	.2083	.2500	.2916	.3333	.3750
Max. length advisable in each single foot f. ll, in feet.....	50.	88.3	125.	167.	250.	286.	357.	417.
Min. velocity, <i>v</i> , of flow advisable in feet, per sec.....	4.134	3.992	3.850	3.775	3.390	3.473	3.255	3.330
Coefficient of flow, <i>m</i> , mean.....	.0060	.0058	.0056	.0055	.0053	.0052	.0051	.0050
Divisor.....	.9	.9	.9	.8	.8	.75	.75	.7

Simple formulas for computing the velocity v , of flow, in round, smooth pipe sewers, of any slope, are *

$$v = \left\{ \frac{2g}{4m} \cdot \frac{h''d}{l} \right\}^{\frac{1}{2}} \quad \text{or} \quad v = \left\{ \frac{2gr i}{m} \right\}^{\frac{1}{2}}$$

and also, approximately, $v = 52 \left\{ \frac{h''d}{l} \right\}^{\frac{1}{2}}$ and also, for diameter,

$$d = \frac{4mlv^2}{2gh}, \quad \text{or } d = .015536 \frac{4mlv^2}{h} \quad \text{in which}$$

$$2g = 64.4.$$

l = length in feet, of pipe in the given slope.

h = the fall in feet, in the same slope.

d = diameter of pipe, in feet.

i = sine of slope = $h \div l$.

r = mean hydraulic radius = contour $\div$ sec. area of pipe.

m = a coefficient deduced from experiments (see table 3).

The above table of elements will be found useful in the application of these formulas.

CAPACITY OF SEWERS.

Having computed the velocity of flow in a given length of sewer in feet per second, the volume of discharge, Q , of the full sewer, in cubic feet per second, is found in the product of velocity into the sectional area of the pipe in square feet.

$$Q = v \times .7854 d^2, \quad \text{or } Q = 6.302 \left\{ \frac{h d^5}{4ml} \right\}^{\frac{1}{2}}$$

Referring to the above table of volume of rain-fall, it is observed, that one inch of rain on one acre of area, gives a total volume of 3630 cubic feet of water.

Suppose, for illustration, we desire to drain an inch of rain-fall, and twenty cubic feet of sewage, from one half acre of roof and yard surfaces in one hour: we shall then have a total rate

*These, with additional formulas for velocity, discharge, diameter, and slope, are given and explained in a treatise on Hydraulic and Water Supply Engineering, by J. T. Fanning, published by Van Nostrand, N. Y., 1881.

of flow in the drain of about one half cubic foot per second. This volume of flow would be carried by a 4-inch pipe with velocity of flow not exceeding five and three-quarters feet per second, which indicates that a 4-inch pipe, with good pitch, will take care of the usual sewage and rain-fall of each half acre of suburban territory, while experience in the care of house-drains teaches that no single house-drain should be less than 4 inches in diameter, because of the liability of smaller pipes being clogged by solid matters that will get into the sewers.

Studying the recorded data of sewer flows from larger or entire village areas, we find that it is an extraordinary flood storm that delivers the storm waters into the sewer at a rate exceeding .5 cubic feet per second per acre of area. The various hindrances that the waters meet on their way toward the sewers increase their time of flowing off beyond the time covered by the shower, so that the excessive rain-falls, such as give an inch of rain in an hour, and which are usually of short duration, are often double the time flowing off that they are in falling.

The rapid gatherings into the sewers are from small areas, such as roofs, paved yards, and paved streets; and the gatherings from rocky surfaces, clayey, compact, and impervious soils, are more rapid than from pervious grounds; and the gatherings from inclined, more rapid than from level surfaces. Here is ample opportunity for the exercise of judgment respecting the volume of flow to be disposed of in a given brief time, when it is desired to gather all the rain-fall from the surface into the sewers. Assuming as a basis for the average New England village, in undulating localities, that the gathering into the main sewers from all sources may in storms equal a total of .5 cubic feet per second per acre of area drained, then the gathering may be from

Rolled roadways	about	.6	or	.65	cu. ft.	per sec.	per acre.
M ^c Adam roads and walks	"	.7	"	.75	"	"	"
Paved surfaces	"	.8	"	.85	"	"	"
Roofs and steep surfaces	"	.9	"	.95	"	"	"

When sewers are to gather rain-fall, their diameters are based upon products of area drained, and cubic feet per second of rain-fall per acre, for which it is necessary to provide. When

the sewers are to gather the household sewage only, then the diameters are based upon the product of number of buildings into average volume of sewage per building, including flushing waters at their maximum flow. Assume the household and excretal sewage per individual to average 3.5 cubic feet per day, and that its maximum rate of flow is such that if continued the whole would be discharged in one hour, and that the average number of persons per dwelling is six, then we have, for rate of discharge, to provide for twenty-one cubic feet of sewage per building in one hour, which equals a flow of .00584 cubic feet per second, which, increased by sufficient water for flushing purposes, will become at least .05 cubic feet per second per building, or about one tenth part the rain-fall flow per acre. But if we consider a number of buildings together discharging into the same branch sewer, and the improbability that their flushing waters will be simultaneously discharged, we may assume that the volume of flow will be a longer time discharging, or the mean rate of flow reduced at least one half; and in populous neighborhoods it is found that the maximum rate of flow of household sewage in the main sewer is not greater than would be sufficient to discharge the whole volume of daily sewage in five hours.

The discharging capacities of different sewers of given diameter vary greatly as the slopes vary;—thus, while a sewer of one foot diameter, sloping one foot in two hundred feet, may discharge with a velocity of 3.8 feet per second, the same pipe having a slope of one foot in twenty feet will discharge full with a velocity of about 12.7 feet per second.

That the approximate discharging capacities of smooth round pipe sewers may be readily discovered for either sewage alone, or sewage and storm waters combined, table No. 4 is here inserted, giving the velocities of flow and discharges of different diameters at different inclinations; and tables No. 5 and 6 give the number of acres each diameter will drain of sewage and storm waters combined at given inclinations, on the assumption that the smallest pipes draining small areas must provide for more rapid discharges and greater fluctuations of flow than the main sewers. If the main sewer of a village must provide for .5 cubic feet of sewage per second per acre, then it will drain on that basis a number of acres equalling the quotient of the dis-

charge divided by .5, and so if a branch sewer draining a single yard must provide for .8 cubic feet per second per acre, then the acres or fractions of acres it will drain equals the quotient of discharge divided by .8. On this basis table No. 5 is computed, using divisors for different diameters, from .5 for main sewers to .9 for single yard drains, as in column of divisors in table No. 3.

If within the limit to be sewered there are manufactories or industries using in their processes large volumes of water that will be discharged as sewage, or if there are water-motors or hydraulic apparatus wasting into the sewers, their extra volumes of water must be considered in proportioning the system of sewers. The unanticipated increase in the use of hydraulic lifts and water-motors has already overtaxed the sewers in several cities.

TABLE 4.

CAPACITIES OF ROUND PIPE SEWERS.

In which the velocity of flow in the sewer is in ft. per sec. ;
discharge in cu. ft. per sec.

SLOPE.	Sine of Slope $\frac{h}{l}$ $i = \frac{h}{l}$	4 inch	6 in.	8 in.	10 in.	12 in.	14 in.	16 in.	18 in.
		.333 ft.	.5	.6667	.8333	1.	1.1667	1.333	1.5
1 in 417	.0024 { vel..... dis.....	.....	.....	.....	.....	.....	.....	.....	3.320 5.866
1 " 385	.0026 { vel..... dis.....	.....	.....	.....	.....	.....	.....	.....	3.495 6.174
1 " 357	.0028 { vel..... dis.....	.....	.....	.....	.....	.....	.....	3.355 4.875	3.610 6.377
1 " 333	.0030 { vel..... dis.....	.....	.....	.....	.....	.....	.....	3.490 4.875	3.755 6.636
1 " 286	.0035 { vel..... dis.....	.....	.....	.....	.....	3.473 3.712	3.800 5.310	4.060 5.670	4.060 7.175
1 " 250	.004 { vel..... dis.....	.....	.....	.....	3.390 2.662	3.735 8.990	4.060 5.670	4.330 7.661	4.330 7.661
1 " 200	.005 { vel..... dis.....	.....	.....	.....	3.845 3.020	4.180 4.470	4.575 6.390	4.901 8.669	4.901 8.669
1 " 167	.006 { vel..... dis.....	.....	.....	3.775 2.059	4.215 8.310	4.602 4.920	5.025 7.020	5.400 9.541	5.400 9.541
1 " 143	.007 { vel..... dis.....	.....	.....	4.075 2.221	4.585 3.558	5.025 5.370	5.485 7.665	5.844 10.339	5.844 10.339
1 " 125	.008 { vel..... dis.....	.....	3.850 1.343	4.370 2.383	4.910 3.856	5.400 5.767	5.845 8.167	6.275 11.068	6.275 11.068
1 " 100	.010 { vel..... dis.....	.....	4.285 1.495	4.880 2.660	5.480 4.304	6.030 6.442	6.515 9.105	7.000 12.369	7.000 12.369
1 " 88.8	.012 { vel..... dis.....	.....	3.992 .784	4.710 1.643	5.375 2.831	6.020 4.728	6.555 7.005	7.124 10.252	7.725 13.650
1 " 62.5	.016 { vel..... dis.....	.....	4.695 .921	5.490 1.916	6.325 3.449	6.980 5.481	7.655 8.182	8.330 11.640	8.965 15.841
1 " 50	.02 { vel..... dis.....	4.134 .361	5.208 1.022	6.175 2.155	7.070 3.855	7.842 6.159	8.647 9.262	9.409 13.147	10.104 17.850
1 " 33.3	.03 { vel..... dis.....	5.160 .450	5.430 1.262	7.640 2.369	8.750 4.757	9.715 7.630	10.691 11.430	11.563 16.231	12.369 21.861
1 " 25	.04 { vel..... dis.....	6.110 .535	7.560 1.484	9.010 2.844	10.200 5.563	11.280 8.859	12.383 13.432	.....	.....
1 " 20	.05 { vel..... dis.....	6.825 .596	8.479 1.665	10.062 3.512	12.293 6.704	12.689 9.955	.....	.....	.....
1 " 16.6	.06 { vel..... dis.....	7.324 .639	9.828 1.929	11.020 3.845	.....	.....	.....	.....	.....
1 " 14.3	.07 { vel..... dis.....	7.985 .696	10.062 1.975	12.020 4.194	.....	.....	.....	.....	.....
1 " 12.5	.08 { vel..... dis.....	8.604 .761	10.920 2.143	.....	.....	.....	.....	.....	.....
1 " 10.	.10 { vel..... dis.....	9.702 .847	12.209 2.396	.....	.....	.....	.....	.....	.....

TABLE 5.

Acres which Round Pipe Sewers will drain (rare floods excepted).

SLOPE.	4 inch	6 inch	8 inch	10 inch	12 inch	14 inch	16 inch	18 inch
	.3333 ft.	.5	.6667	.8333	1.	1.6667	1.1333	1.5
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1 in 417.	.....	.....	.....	.....	.....	.....	.....	8.38
1 " 385.	.....	.....	.....	.....	.....	.....	.....	8.82
1 " 357.	.....	.....	.....	.....	.....	.....	6.25	9.11
1 " 338.	.....	.....	.....	.....	.....	.....	6.50	9.48
1 " 286.	.....	.....	.....	.....	.....	4.95	7.08	10.25
1 " 250.	.....	.....	.....	.....	3.328	5.82	7.56	10.98
1 " 200.	.....	.....	.....	.....	8.775	5.96	8.52	12.37
1 " 167.	.....	.....	.....	2.574	4.138	6.56	9.36	13.63
1 " 148.	.....	.....	.....	2.778	4.446	7.16	10.22	14.77
1 " 125.	.....	.....	1.493	2.979	4.820	7.69	10.89	15.94
1 " 100.	.....	.....	1.662	3.326	5.380	8.59	12.14	17.07
1 " 83.3	.....	.871	1.826	3.664	5.910	9.34	13.27	19.50
1 " 62.5	.....	1.024	2.129	4.312	6.852	10.91	15.52	22.68
1 " 50.	.401	1.136	2.395	4.819	7.699	12.85	17.53	25.50
1 " 38.3	.500	1.403	2.963	5.947	9.538	15.24	21.64	31.28
1 " 25.	.595	1.649	3.494	6.954	11.074	17.91	.....	.....
1 " 20.	.662	1.850	3.902	8.381	12.444	.....	.....	.....
1 " 16.6	.710	2.144	4.273	.....	.....	.....	.....	.....
1 " 14.3	.774	2.195	4.661	.....	.....	.....	.....	.....
1 " 12.5	.834	2.382	.....	.....	.....	.....	.....	.....
1 " 10.0	.941	2.663	.....	.....	.....	.....	.....	.....
Divisors.....	.9	.9	.9	.8	.8	.75	.75	.7

QUALITIES OF SEWER PIPES.

The discharges of sewers given in the accompanying tables have been computed for sewers that are *smooth*, with joints well fitted. Pipe sewers exceeding 15" in diameter are advisedly of *egg-shaped* section. There is ultimate economy in using, for yard and branch sewers, a good quality of glazed stone-ware pipes, for crumbling and broken sewers are not only expensive annoy-

ances, but saturators of soils and generators of putrescent odors. The pipes should be of ample thickness to uniformly resist the earth pressures that may come upon them, and they should be so compounded and burned as to be impervious and tough, and at the same time free from warps and fire cracks, and should be so glazed as to resist attacks of sewer ammonias and acids.

Preference is given to the *sleeve-joints* where connections of other pipes are liable to be made, or the pipes are liable to require examinations for removal of stoppages or other cause, and

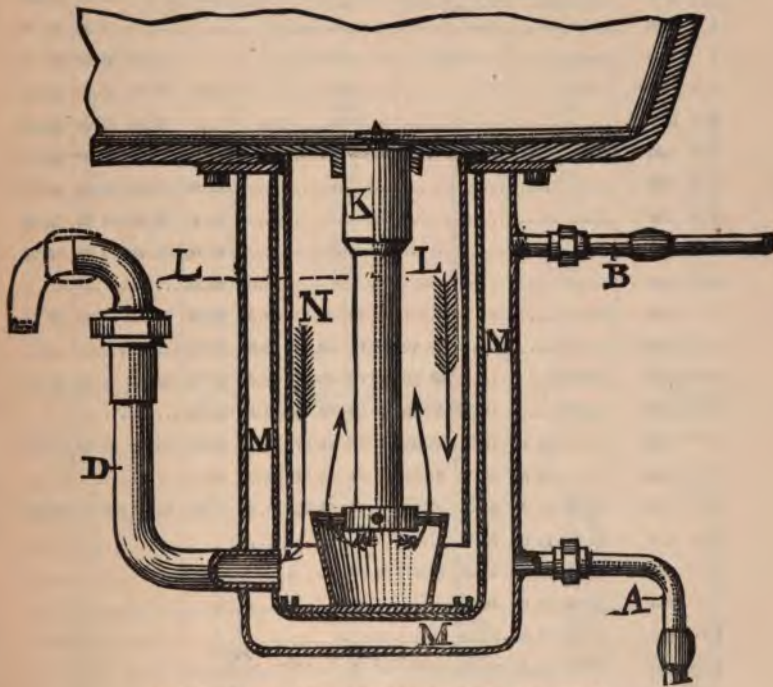


Fig. 6.—SECTION OF ATTACHED GREASE TRAP.

the butt or sleeve-joint is the standard for pipes exceeding 12" in diameter. Such pipes with their connections are shown in the accompanying illustrations, Figs. 2, and 3, and the commercial designation of each is given in the figures.

TABLE 6.

ACRES WHICH SMALL EGG-SHAPED SEWERS WILL DRAIN, RARE
FLOODS EXCEPTED. DIAMETERS IN FEET AND INCHES.

SLOPE.	1'-4"x2'-0"	1'-6"x2'-3"	1'-8"x2'-6"	1'-10"x2'-9"	2'-0"x3'-0"	2'-2"x3'-3"	2'-4"x3'-6"	2'-6"x3'-9"	2'-8"x4'-0"	2'-10"x4'-3"	3'-0"x4'-6"
1 in 1400	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50.30
1 " 1300	.....	.....	.....	.....	.....	.....	.....	.....	.....	41.38	52.36
1 " 1200	.....	.....	.....	.....	.....	.....	.....	.....	37.12	48.08	54.76
1 " 1100	.....	.....	.....	.....	.....	.....	.....	.....	38.84	45.27	57.58
1 " 1000	.....	.....	.....	.....	.....	.....	.....	.....	40.84	47.48	60.30
1 " 900	.....	.....	.....	.....	.....	.....	.....	.....	43.06	50.30	64.10
1 " 800	.....	.....	.....	.....	.....	.....	.....	35.88	46.03	53.63	68.28
1 " 700	.....	.....	.....	.....	.....	.....	.....	38.47	49.48	57.84	73.08
1 " 600	.....	.....	.....	.....	.....	.....	.....	41.06	53.45	62.30	79.23
1 " 550	.....	.....	.....	.....	.....	.....	36.66	43.66	.....	.....	.....
1 " 500	.....	.....	.....	.....	24.15	32.05	38.55	45.86	58.91	68.72	87.16
1 " 450	.....	.....	.....	20.48	25.55	33.86	40.80	48.63	.....	.....	.....
1 " 400	.....	.....	.....	21.76	27.09	35.94	43.41	51.53	66.33	77.12	97.83
1 " 350	.....	.....	18.30	23.33	29.09	38.68	46.55	55.22	.....	.....	.....
1 " 300	.....	14.16	19.35	25.33	31.55	41.77	50.36	59.80	76.72	89.89	113.70
1 " 250	.....	15.57	21.84	27.82	34.64	45.88	55.22	65.61	.....	.....	.....
1 " 200	13.00	17.47	24.53	31.05	38.74	51.36	61.88	73.33	94.03	109.51	138.33
1 " 190	13.38	17.97	25.17	.....	.....	.....	.....	.....	.....	.....	.....
1 " 180	13.71	18.45	25.92	32.87	40.53	.....	.....	.....	.....	.....	.....
1 " 170	14.14	19.00	26.66	.....	.....	.....	.....	.....	.....	.....	.....
1 " 160	14.59	19.61	27.48	...	.....	.....	.....	.....	.....	.....	.....
1 " 150	15.07	20.23	28.38	36.02	44.76	.....	.....	.....	.....	.....	.....
1 " 140	15.59	20.95	29.35	.....	.....	.....	.....	.....	.....	.....	.....
1 " 130	16.23	21.78	30.51	.....	.....	.....	.....	.....	.....	.....	.....
1 " 120	16.85	22.64	31.63	40.28	.....	.....	.....	.....	.....	.....	.....
1 " 110	17.64	23.69	33.12	.....	.....	.....	.....	.....	.....	.....	.....
1 " 100	18.52	24.85	34.76	43.97	.....	.....	.....	.....	.....	.....	.....
Divisors.....	.7	.7	.65	.65	.65	.6	.6	.6	.55	.55	.5

COST OF SEWER PIPES.

The price-list of vitrified sewer and drain-pipes has been, during the spring of 1884, as follows :

TABLE 7.

PRICE LIST OF VITRIFIED PIPES.

Diameter.	Straight Pipes	Sectional	Weight	Approximate	Branches.
Inches.	per lin. foot.	area.	per lin. foot.	thickness.	2 ft. long.
Inches.		Sq. ft.	Lbs.	Inches.	
2	\$0.13	.0218	7	5-16	\$0.61
3	.16	.0491	8	3/8	.77
4	.20	.0873	10	1/2	.95
5	.25	.1364	12	5/8	1.15
6	.30	.1963	16	11-16	1.35
8	.45	.3490	22	3/4	1.90
9	.55	.4421	26	13-16	2.25
10	.70	.5454	32	7/8	2.70
12	.80	.7854	46	1	3.50
15	1.25	1.2271	67	1 1/8	4.50
18	1.60	1.7671	84	1 1/4	6.50
20	2.00	2.1818	99	1 5-16	9.50
24	3.25	3.1416	130	1 3/4	12.50

Diameters.	Bends, Curves, each.	Reducers, Increasers, each.	Slants, each.	Traps, each.	Strainers, Stoppers, each.
Inches.					
2	\$0.40	\$0.40	.....	\$1.00	\$0.13
3	.50	.50	.....	1.50	.16
4	.65	.65	.....	2.00	.20
5	.85	.85	.....	2.50	.25
6	1.15	1.15	\$0.45	3.50	.30
8	2.00	2.00	.68	6.00	.45
9	2.50	2.50	.....	7.00	.55
10	3.00	3.00	.95	8.00	.70
12	3.75	3.75	1.20	10.00	.80
15	5.00	5.00	1.88	.....	1.25
18	7.50	7.50	2.40	.....	1.60
20	8.00	8.00	3.00	.....	2.00
24	15.00	15.00	.....	.....	3.25

From this price-list a discount may be usually obtained, varying in medium orders from ten to thirty per cent. according to the state of the market, and special prices are quoted for larger lots.

TABLE 8.
SEWER TRENCH EXCAVATIONS.
Quantities in cu. yds. per lineal ft. for given bottom breadths and depths.

Callbrea.	6 ft. deep.		7 ft. deep.		8 ft. deep.		9 ft. deep.		10 ft. deep.		12 ft. deep.		14 ft. deep.	
	Breadth.	cu. yd.	Breadth.	cu. yd.	Breadth.	cu. yd.	Breadth.	cu. yd.	Breadth.	cu. yd.	Breadth.	cu. yd.	Breadth.	cu. yd.
4" pipe	1-8	.481	1-8	.583	1-8	.681	2-0	.917	2-0	1.049	2-0	1.833	2-0	1.642
6" "	1-8	.481	1-8	.583	1-8	.681	2-0	.917	2-0	1.049	2-0	1.833	2-0	1.642
8" "	2-0	.586	2-0	.688	2-0	.790	2-0	.917	2-4	1.172	2-4	1.461	2-4	1.815
10" "	2-0	.586	2-0	.688	2-6	.988	2-6	1.083	2-6	1.255	2-6	1.555	2-6	1.901
12" "	2-0	.586	2-0	.688	2-6	.988	2-6	1.083	2-6	1.255	2-6	1.555	2-6	1.901
15" "	2-6	.687	2-6	.789	2-9	1.012	2-9	1.080	2-10	1.858	3-0	1.777	3-0	2.161
18" "	2-8	.704	2-8	.843	3-0	1.087	3-0	1.167	3-2	1.481	3-2	1.852	3-2	2.247
20 brick	3-4	.852	3-4	1.015	3-8	1.284	3-8	1.472	3-8	1.687	3-8	2.074	3-8	2.506
24 "	3-8	.926	3-8	1.102	4-0	1.383	4-0	1.583	4-0	1.790	4-0	2.222	4-0	2.679
30 "	4-0	1.000	4-0	1.188	4-6	1.531	4-6	1.750	4-6	1.975	4-6	2.444	4-6	2.938
1-4x2-0	2-8	.704	2-8	.843	3-0	1.087	3-0	1.250	3-2	1.481	3-2	1.852	3-2	2.247
1-6x2-3	2-8	.704	2-8	.843	3-0	1.087	3-0	1.250	3-2	1.481	3-2	1.852	3-2	2.247
1-8x2-6	2-8	.704	2-8	.843	3-0	1.087	3-0	1.250	3-2	1.481	3-2	1.852	3-2	2.247
1-10x2-9	3-0	.778	3-0	.929	3-4	1.185	3-4	1.361	3-6	1.605	3-6	2.000	3-6	2.419
2-10x3-0	3-0	.778	3-0	.929	3-4	1.185	3-4	1.361	3-6	1.605	3-6	2.000	3-6	2.419

For the average breadth of trench, add to the above bottom breadths one inch for each foot of depth in stiff soil. The cost of earth excavation, including back-filling it again, shoring of trenches, and keeping trenches clear of water, may range in earth works from 20 cents to 50 cents per cubic yard excavated, according to the depth of the trench and nature and condition of earth; and cost of rock excavation in trenches may vary from \$2.50 to \$4.50 per cubic yard.

Excluding costs of rock excavation and keeping trenches dry, the approximate costs per foot of good pipe sewers, laid complete, are,—15 inch diameter, \$2.15; 12 inch, \$1.50; 10 inch, 1.35; 8 inch, .95; 6 inch, .55, and 4 inch, .40; and of man-holes \$45.00; inlet-basin, \$75.00; and flush tanks, \$60.00.

TABLE 9.

BRICK WORK OF SEWERS.

Calibres. Round.	Bricks per lin. foot	Calibres. Egg-shaped.	Bricks per lin. foot.
.....	.....	1- 2x1-9	42 at \$0.02 laid=\$0.84
15 inches.	38 at \$0.02 laid=\$0.76	1- 4x2-0	48 " " = 0.96
16 "	40 " " = 0.80	1- 6x2-3	53 " " = 1.06
18 "	43 " " = 0.86	1- 8x2-6	57 " " = 1.14
20 "	48 " " = 0.96	1-10x2-9	63 " " = 1.26
24 "	55 " " = 1.10	2- 0x3-0	67 " " = 1.34
28 "	63 " " = 1.26	2- 2x3-3	72 " " = 1.44
30 "	67 " " = 1.34	2- 4x3-6	78 " " = 1.56
36 "	78 " " = 1.56	2- 6x3-9	82 " " = 1.64
.....	.....	2- 8x4-0	87 " " = 1.74
.....	.....	2-10x4-3	93 " " = 1.86
.....	.....	3- 0x4-6	97 " " = 1.94

TABLE 10.
EGG-SHAPED SEWER ELEMENTS.

Calibres.	Sec. areas.	Hydraulic. Mean depth.	Diameters for nearly equivalent sec. areas.
Inches.	In sq. ft.		Inches.
1- 2x1-9	1.1563	.3380	15.
1- 4x2-0	2.0418	.3863	19.
1- 6x2-3	2.5841	.4345	22.
1- 8x2-6	3.1903	.4828	24.
1-10x2-9	3.8602	.5311	27.
2- 0x3-0	4.5940	.5794	28.
2- 2x3-3	5.3916	.6277	32.
2- 4x3-6	6.2529	.6760	34.
2- 6x3-9	7.1781	.7242	36.
2- 8x4-0	8.1671	.7725	39.
2-10x4-3	9.2199	.8208	42.
3- 0x4-6	10.3365	.8691	44.

FRICTIONS OF SEWERS.

In a series of experiments conducted by Mr. Roe, C. E., at the suggestion of the Metropolitan Sanitary Commission, it was found that water flowed through a level glazed pipe in three fourths the time required for the same volume to flow through a level brick pipe, and when the experiments were repeated with pipes sloping $2\frac{1}{4}$ " in 50 feet, but sixty-five per cent. as much time was required for the glazed as for the brick pipe to pass the same volume of water.

Brick pipes to have capacities equivalent to glazed pipes must therefore have increased diameters or increased slope. According to Mr. Roe's experiments, a glazed 12" pipe with slope of 1 in 225 would be nearly equivalent in capacity to a brick 12" pipe with slope of 1 in 100. Wood *plank drains*, even though V shaped, with apices down, as they should be placed, prove much less efficient than glazed pipes. Stone culvert drains with flat bottoms are not at all suitable, and should never be used for sewers, because they will soon choke with deposits. Except in

localities where lumber is very cheap, the first cost of plank sewers when laid will be almost equal to the cost of good glazed pipe sewers, while the cost of cleaning and maintaining plank sewers will be much more than double the cost of keeping in order properly laid glazed sewers.

SLOPES OF SEWERS.

When sewers have not sufficient slope to be self-cleansing, they are failures at the outset. The velocity of flow in them

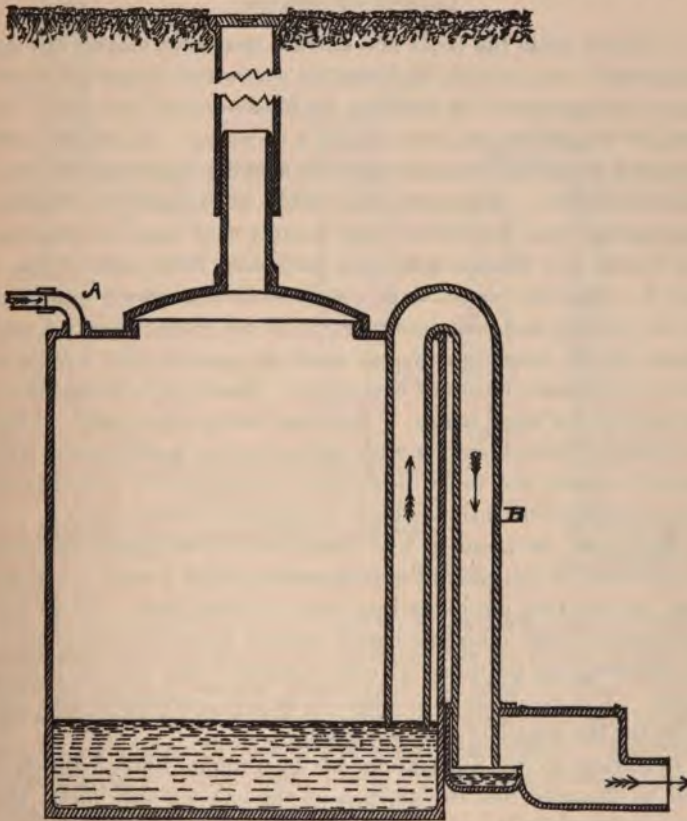


Fig. 7.—FIELDS' FLUSH TANK.

must give force to carry all solid matters forward. In table No. 3 are given the minimum velocities of flow admissible in

different sizes of round glazed pipes, and also in the column immediately above are given the minimum slopes of round glazed pipes that may be expected to give the minimum velocities. Attention was above called to the fact that greater slopes must be given to rough pipes than to smooth to secure an equal velocity; and, further, it is to be observed that a greater velocity is necessary in rough pipes than in smooth pipes to secure an *equal* cleansing effect, the difference being far greater in small than in large pipes.

DETAILS OF SEWERS.

If waters from the roofs and surface waters of storms are not admitted to the sewers in localities where the slopes are light, some arrangements for flushing the house-drains, and the 6," 8" and 10" branch sewers, are almost a necessity. It is here quite desirable, in most instances, that the flushing apparatus be automatic in action. Automatic flush tanks are supplied by dealers, and among those heretofore most largely used may be mentioned Fields' and Shones' patented automatic flush tanks, Figs. 7 and 8. The first object to be obtained in homestead sewerage is the prompt and complete removal of all refuse; hence every detail of the sewerage system must be studied with a view to the full accomplishment of this object. Each curve in the sewers should have a large radius, T branches being rarely used. Connections of branch sewers with mains, and of house-drains with branch sewers, are to be made with curves and Y branches as shown in the illustrations (Figs. 2 and 3) of sewer pipes.

Man-holes for cleaning and inspection of the pipes are to be constructed at the ends of curves, and on light grades are desirable at intervals not exceeding three hundred feet. These are, on straight lines, alternated with *lantern holes* for the purpose of detecting the positions of obstructions in the sewers, if such occur. The man-hole *covers* should be fully perforated with *air-holes* for the ventilation of the sewers.

Referring to the illustrations of flush tanks, Figs. 7 and 8, it will be observed that the pipes A on the left are the inlets, and the curved pipes B on the right are the siphon outlets. In Fig. 7 the inlet is shown as a small service supplying clean water. In Fig. 8 the inlet is shown as a 4" sewer pipe, as, for instance, when the house-drain is of considerable length and has but a

slight inclination and needs flushing. In such case the tank is placed in the line of the drain, and the small service pipe *d* feeds

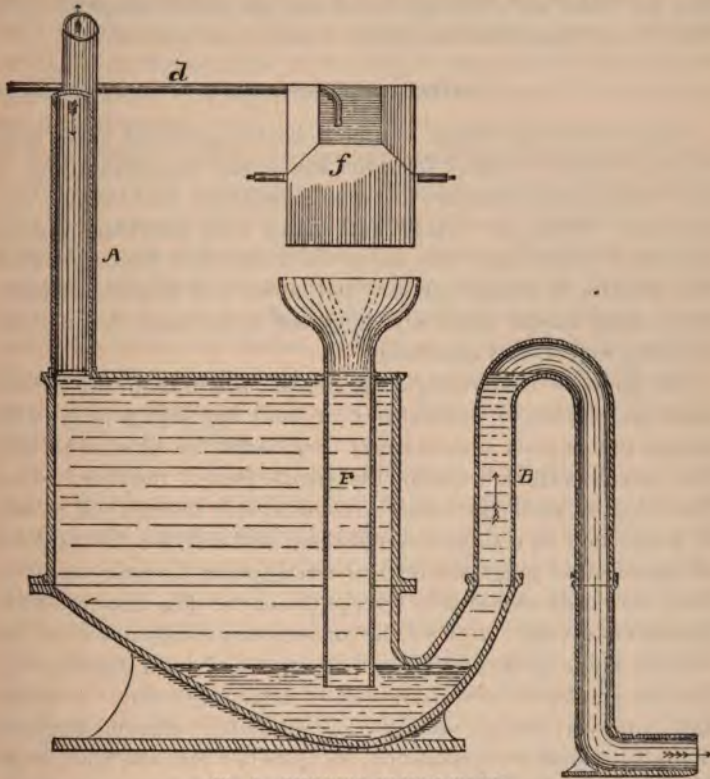


Fig. 8.—SHONE'S FLUSH TANK.

into a tumbling box *f*, which at brief intervals tips over automatically, discharging its contents through the funnel *E* into the tank and sets the siphon in action if the tank is full. The siphon discharges the whole contents of the tank quickly, so that it may rush down the drain with a scouring action. Such tanks may be placed at the heads of long lines of branch sewers which might not otherwise prove self-cleansing.

Respecting the plumbing fixtures inside the house, we simply here assume that every fixture will be properly trapped, flushed, and ventilated. We advise, further, that a trap be placed on the main drain outside and near the cellar wall, and that it have a

hand-hole accessible for inspection. This trap, Fig. 9, should have also a vent or air-pipe connection between the water seal and the cellar wall, through which and the entire circuit of open topped soil pipes there should be a free circulation of air.

DISPOSAL OF SEWAGE.

Even before the sewage of a household is gathered into a sewer-pipe to lead it away from the house, the final disposition of the troublesome substance must be considered, and the question decided. When the village authorities have provided a good system of sewer-pipes into which the drains may discharge, then this question is happily settled; and in our New England climate, alternating intense heats with long and deep frosts, the question is rarely well settled otherwise.

On large or moderately large estates, where there are porous soils and favorable undulations of land, the sewage may, with proper precautions and constant care, safely be applied to surface or sub-surface irrigation the greater part of the year. Since the irrigation methods require so considerable an outlay of money in proportion to results accomplished, and call for the exercise of experienced judgment in their arrangement to ensure success, they are rarely undertaken except under the direction of an experienced adviser; so it will be unnecessary to discuss here the various kinds of tanks, valves, irrigation and drain pipes, or apparatus employed, or the methods of arranging them. It is certain, however, that the sewage must ultimately, whether disposed of by individual or corporation, be absorbed into the land, or go direct into a running stream or large body of water. In America, the village disposal of sewage has hitherto been, except in the immediate vicinity of the larger cities, direct into the running streams or ocean. Protection of the public water supplies, and of the public health of villages at lower points on the streams, will undoubtedly modify sometime hereafter this simple disposition in the streams and their lakes.

VILLAGE SEWERS.

When the need of a complete sewerage system is generally acknowledged in any village, it is usually an indication that its natural watercourses are already made foul by sink and excre-

mentitious drainage, and that so-called filth diseases have become prevalent in the warm seasons. The observance that the little streams are foul, is perhaps followed by the suggestion that they be covered over and their noxious odors confined. On the contrary, the true course is, usually, to prevent the filths from reaching them, and to purify them with water and the most free circulation of air.

In a village it is rarely advisable to attempt to gather all the storm waters in sewer-pipes, as is often a necessity in cities. But it is usually advisable to gather into the pipes rain water from the roofs and portions of the yards, and surplus sub-soil waters, and these serve an admirable purpose in flushing the pipes, especially when the public or private water supply is not used for automatic flushes by siphon or tumbling-box action. The contour lines and slopes of the village must largely influence the positions of main sewers, their depths below the surface, and their grades.

The general plan of village sewers is much like a river system. The sewage will be gathered by the sewer-pipes from the subordinate water-sheds of the village into the main valley, much as they are in the river systems gathered into the principal river branches and then into the main stream, the local conditions determining variations of plan according to local circumstances. The main sewers may often be parallel with rather than at right angles to the main watercourse, thus intercepting the polluted drainage that would otherwise gather in the watercourse. Sometimes two or more intercepting sewers will lie parallel, and yet these lines may not interfere with the gathering of the greater part of the storm waters into the natural course, where they will move toward the ocean in the pathway laid out by nature. The sewage must not be discharged into a quiet pond or bay within or near the village.

Where the storm waters are troublesome on the slopes of the village and on the streets, they may be admitted to the sewers through *inlet basins*, and led near the main watercourse, and then in great storms be permitted to overflow their storm waters at several points into the natural watercourse through arranged *storm overflows*, thus economizing the size and cost of the sewers. In such case the storm overflows should be so arranged

that the first waters of the storm will thoroughly wash out the sewers before the overflow commences, so that the minimum quantity of house drainage will reach the natural watercourse, and then only with the maximum of dilution. Such economic points are matters of computation in detail when the strictest economy consistent with full efficiency is demanded.

In the discussion above, of capacities of sewers, it was suggested, that while a 4" pipe with good pitch might successfully

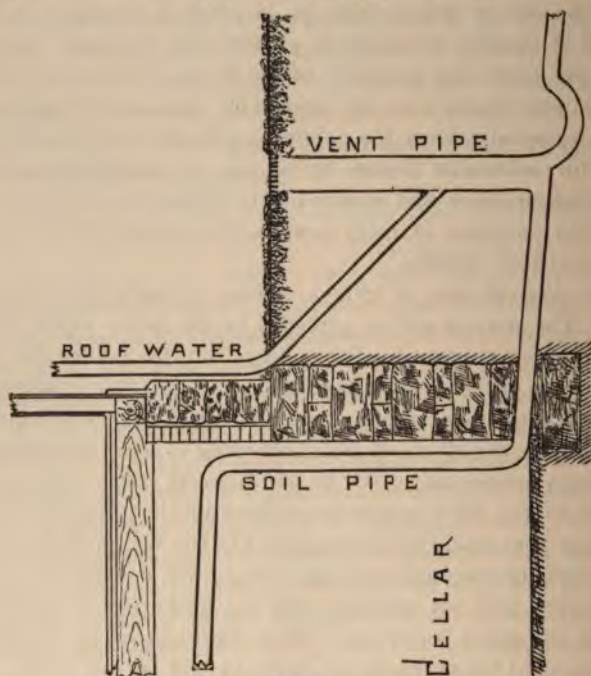


Fig. 9.

drain half an acre, including storm waters, it was still advisable, on account of liability of chokage, and for ease of clearing, that each house-drain, even the cottage drain connecting with the street sewer, should be as large as 4" diameter and very smooth inside. On the other hand, branch sewers receiving sewage from a number of house-drains should not be more in excess of 6" than is necessary to enable them to discharge freely the maximum quantity of drainage that will be delivered to them. The

magnitude of this maximum quantity manifestly depends on whether it includes a portion or the entire volume of storm waters.

In the average village we may assume, for preliminary calculations, the volume of sewage, sub-soil drainage, and roof waters of each cottage or separate dwelling to be .05 cubic feet per second maximum flow, and that this volume will be increased, in proportion to the admission from other surfaces of storm waters to the sewers, to .5 cubic feet per second per acre for the entire village, and to .85 cubic feet per second per acre, as above stated, on paved surfaces of moderate area. When along the lines of sewers there are manufactories, industrial processes, or hydraulic apparatus, or large boarding-houses from which there are large wastes of waters and sewage, their wastes must be counted in detail.

PROPORTIONS OF SEWER SYSTEMS.

Having plotted upon a map of the village the position of the main trunk sewer, the positions of the lateral main sewers, and the branch sewers that receive the house-drains, the volumes of flow received into each above given points may be summed together, counting the flow from each house-drain at .05 cubic feet per second, and counting the flow from the acreage of area other than roof surfaces draining into each branch sewer at from .5 to .9 cubic feet per second per acre, according to the nature of the surfaces, then summing the volumes of flow from branch sewers into lateral mains, and then similarly summing the volumes from lateral mains into the main trunk sewer. On a skeleton map of the pipes prepared as thus suggested, the maximum volume per second flowing from each branch sewer into the lateral may be marked on the branch near the junction, and also the volume of flow from each lateral into the main may be marked near each junction, and the volume of discharge of the main may be marked near its outlet, and also the volumes of flow at prominent intermediate points may be marked on each of the pipes.

Next will be considered the slope or inclination of each separate section of pipe whose volume has been computed and marked on the plan, and a grade will be established for each section

that will give a velocity of flow, preferably not less than 5 feet per second for small pipes, and certainly not less than the minimum velocities indicated for the several diameters in table No. 3. The velocities may be computed by the formulas immediately following table No. 3; and also the velocities and discharges for given diameters and inclinations of sewers may be found approximately in table No. 4; and also, in tables Nos. 5 and 6, the areas they will drain of storm waters.

The ultimate practical success of the sewer system depends upon the pipes being smooth, hard, durable, and their careful alignment, bedding, and jointing, upon their having inclinations and velocities of flow that will insure them self-cleansing properties, and upon each section of pipe being properly proportioned for its own work. The *outfall* of the trunk main must conform to such conditions that the sewage cannot, after its discharge, endanger the health of the village or the health of other towns or villages.

The plan of the village sewer system, even though specially adapted to all the local circumstances, is nevertheless usually quite simple in conception and arrangement, and not difficult in practical construction; yet good judgment and some mechanical skill are requisite in the planning and construction of such of its details, as its flush-tanks, manholes, lantern holes, ventilators, inlet basins, and storm overflows, that they may be effective, durable, economical, and require the minimum outlay for care and maintenance.

FINANCIAL INFLUENCES.

From data above presented, an approximate estimate may be made of an ordinary village system of sewers, and also of the house and yard drainage pipes other than interior plumbing.

The preliminary difficulties of the house drainage and village sewerage system will undoubtedly be financial rather than practical. It is most unfortunate for the villages that good sewerage is necessarily somewhat expensive, but with the results accompanying its accomplishment there comes an almost invaluable return of comfort, luxury, and self-protection. These have a cash value, though not easily rated, which offset the cost of sewerage. Again: there must be placed in the balance of

accounts, opposite the cost of sewers, some fair cash estimate of the values of losses of strength, vigor, health, labor, and comfort, and depreciations of values of properties due to the unsanitary conditions of the household and village. Let each village estimate the amount of this side of the account for itself if it can, and note how heavy an annual price it pays for lack of protection, and perhaps it will have to place also the values of the lives of some dear ones who are gone in the account. When the epidemic has swept past, truly it may not be easy to agree upon the cash value of our neighbors' lost children. What if they are our own? Perchance our own family barely escaped last season, only to be endangered again.

APPENDIX.

APPENDIX.

SANITARY LAWS PASSED BY THE LEGISLATURE OF 1883.

AN ACT TO REGULATE THE SALE AND INSPECTION OF MILK.

Be it enacted by the Senate and House of Representatives in General Court convened :

SECTION 1. The mayor and aldermen of cities and the selectmen of towns may annually appoint one or more persons to be inspectors of milk for their respective places, who shall be sworn before entering upon the duties of their office. Each inspector shall publish a notice of his appointment for two weeks in a newspaper published in his city or town, or, if no newspaper is published therein, he shall post up such notice in two or more public places in such city or town.

SEC. 2. Such inspectors shall keep an office and books for the purpose of recording the names and places of business of all persons engaged in the sale of milk within their city or town. They may enter all places where milk is stored or kept for sale, and all carriages used for the conveyance of milk ; and when they have reason to believe that any milk found by them is adulterated, they shall take specimens thereof and cause the same to be analyzed, or otherwise satisfactorily tested, the result of which analysis or test they shall record and preserve as evidence ; and a certificate of such result, sworn to by the analyzer, shall be admissible in evidence in all prosecutions under this act. The inspectors shall receive such compensation as the mayor and aldermen or selectmen may determine.

SEC. 3. In all cities and towns in which there is an inspector of milk, every person who conveys milk in carriages, or otherwise, for the purpose of selling the same in such city or town, shall annually, on the first day of May, or within thirty days thereafter, be licensed by the said inspector or inspectors to sell milk within the limits thereof, and shall pay to such inspector or inspectors fifty cents each, to the use of the city or town. All inspectors shall pay over monthly, to the treasurer of the city or town, all sums collected by them. Licenses shall be issued only in the names of the owners of carriages, or other vehicles, and shall for the purposes of this act be conclusive evidence of ownership. No license shall be sold, assigned, or transferred. Each license shall record the name, residence, place of business, and the number of carriages, or other vehicles, used of the person engaged in carrying or selling said milk, and the number of the license. Each licensee shall, before engaging in the sale of milk, cause his name, the number of his license, and his place of business to be legibly placed on each outer side of all carriages or vehicles used by him in the conveyance and sale of milk, and he shall report to the inspectors any change of driver or other person employed by him which may occur during the term of the license. Whoever, without being first licensed under the provisions of this section, sells milk or exposes it for sale, from carriages or other vehicles, or has it in his custody or possession with intent so to sell, and whoever violates any of the provisions of this section, shall for a first offence be punished by a fine of not less than thirty nor more than one hundred dollars; for a second offence, by a fine of not less than fifty nor more than three hundred dollars; and for a subsequent offence, by a fine of fifty dollars and by imprisonment for not less than thirty nor more than sixty days.

SEC. 4. Every person before selling milk, or offering it for sale, in a store, booth, stand, or market-place in a city or town in which an inspector or inspectors of milk are appointed, shall register in the books of such inspector or inspectors, and shall pay to him or them fifty cents to the use of such city or town; and whoever neglects so to register shall be punished for each offence by fine of not less than ten nor more than twenty dollars.

SEC. 5. Whoever, by himself, or by his servant or agent, or as the servant or agent of any other person, sells, exchanges, or delivers, or has in his custody or possession with intent to sell or exchange, or exposes or offers for sale or exchange, adulterated milk, or milk to which water or any foreign substance has been added, or milk produced from cows fed on refuse of distilleries, or from sick or diseased cows, shall for a first offence be punished by a fine not less than fifty nor more than two hundred dollars; for a second offence, by fine of not less than one hundred nor more than three hundred dollars, or by imprisonment for not less than thirty nor more than sixty days; and for a subsequent offence, by fine of fifty dollars and by imprisonment for not less than sixty nor more than ninety days.

SEC. 6. Whoever, by himself, or by his servant or agent, or as the servant or agent of any other person, sells, exchanges, or delivers, or has in his custody or possession with intent to sell or exchange, or exposes or offers for sale as pure milk any milk from which the cream, or a part thereof, has been removed, shall be punished by the penalties provided in the preceding section.

SEC. 7. No dealer in milk, and no servant or agent of such a dealer, shall sell, exchange, or deliver, or have in his custody or possession with intent to sell, exchange, or deliver, milk from which the cream, or any part thereof, has been removed, unless in a conspicuous place above the centre upon the outside of every vessel, can, or package from which such milk is sold, the words "Skimmed Milk" are distinctly marked in letters not less than one inch in length. Whoever violates the provisions of this section shall be punished by the penalties provided in section five.

SEC. 8. Any inspector of milk, and any servant or agent of an inspector, who wilfully connives at or assists in a violation of the provisions of this act, shall be punished by fine of not less than one hundred nor more than three hundred dollars, or by imprisonment for not less than thirty nor more than sixty days.

SEC. 9. In all prosecutions under this act, if the milk is shown upon analysis to contain more than eighty-seven per cent. of watery fluid, or to contain less than thirteen per cent. of milk solids, it shall be deemed for the purposes of this act to be adulterated.

SEC. 10. It shall be the duty of every inspector to institute a complaint for a violation of any of the provisions of this act on the information of any person who lays before him satisfactory evidence by which to sustain such complaint.

SEC. 11. Each inspector shall cause the name and place of business of every person convicted of selling adulterated milk, or of having the same in his possession with intent to sell, to be published in two newspapers in the county in which the offence was committed.

SEC. 12. This act shall take effect and be in force only in those towns which shall by vote adopt its provisions, and cities wherein inspectors are appointed, as provided in section one.

Approved August 15, 1883.

AN ACT IN RELATION TO THE DRAINAGE OF LAND.

Be it enacted by the Senate and House of Representatives in General Court convened :

SECTION 1. Any person having the ownership of any low lands or swamps which cannot be drained except across adjacent lands of other persons, and any person claiming to be injuriously affected by the malarious character of lands in the vicinity of his residence, which are wet, spongy, or covered with stagnant water, may be authorized to establish such drains and ditches as may be necessary, in manner hereinafter provided.

SEC. 2. The party desiring such improvement shall apply by petition to the selectmen of the town, or the mayor and aldermen of the city in which the premises are situated, setting forth the names of the persons interested, if known, and also in detail the nature of the proposed improvement, and the situation of the adjoining lands.

SEC. 3. The selectmen or the mayor and aldermen shall appoint a time and place of hearing, and notify all persons interested thereof by causing a copy of the petition and notice of the time and place appointed to be delivered to each of them, or left at his abode, if known, and residing in the state, fourteen days before the hearing.

SEC. 4. If any owner or person interested is unknown, or resides out of the state, such copy or notice shall be posted in two or more public places in the town or city twenty days before the hearing, and published in some newspaper printed in the county, and if there is no such paper, then in a newspaper in an adjoining county.

SEC. 5. The selectmen, or the mayor and aldermen, shall meet at the time and place appointed, and after examination, inspection, and the hearing of evidence, shall determine whether the improvement prayed for is necessary; and if they find it to be so, they shall proceed to lay out and establish the same in such manner as shall do as little injury as practicable, and they shall assess to the owners of the land damaged by such laying out the amount of damages which, in their opinion, such owners will sustain. They shall apportion the damages equitably among all parties to be benefited and the town or city in which the premises are situated, if, in their opinion, the town or city ought to pay any portion thereof, otherwise solely among the parties to be benefited, having regard in such apportionment to the benefits each will receive. Such apportionment shall be deemed conclusive upon each of the parties charged with the burden thereof, not only as it respects such damages, but in respect to the expense of the construction of such improvement, and the subsequent keeping of the same in repair, unless an appeal be taken as hereinafter provided. The damages so apportioned, the expense of the construction of such improvement and of keeping the same in repair, shall be paid by the town or city, and there shall be assessed to the several persons benefited by such improvement their proportional part, ascertained as before provided, of the same, which shall be included in the next town or city taxes of such persons, and shall be a lien upon the real estate benefited thereby, and be collected in the same manner as other taxes upon real estate, and shall be liable to abatement as other taxes now are.

SEC. 6. The selectmen, or the mayor and aldermen, shall locate by metes and bounds on the land the improvement by them laid out, and may prescribe the kind of drain or ditch to be constructed and the manner in which it shall be constructed.

SEC. 7. The selectmen, or the mayor and aldermen, within

thirty days after the hearing, shall make a full return of their doings to the town or city clerk, which return shall be by him recorded in the town or city records.

SEC. 8. Any land-owner, or other person aggrieved by the decision of the selectmen or the mayor and aldermen in the assessment of damages in any case relating to such improvement, may appeal therefrom to the supreme court, by petition, within one year after the record of the laying out of such improvement is made in the town or city records; and any land-owner or other person aggrieved by the decision of the selectmen or the mayor and aldermen in laying out such improvement, may appeal therefrom to said court, by petition, which shall be filed within sixty days after the return thereof is recorded, if he had actual notice of such laying out, otherwise within one year after such return is recorded in the town or city records, and shall file with it a bond in the sum of two hundred dollars, with sufficient sureties, conditioned to pay to the petitioners for such improvement the costs that may be awarded them in case the decision of the selectmen or mayor and aldermen is affirmed.

SEC. 9. When such petition is filed, the clerk shall issue an order of notice, with a copy of the petition returnable at the next term of the court, and the petitioners shall cause a certified copy of the same to be given to one of the selectmen, or the mayor or one of the aldermen, and the clerk of the town or city in which such improvement may be located, or left at the abode of each of them twenty-eight days before the next term of court. When such notice has been given, and such other notice as the court may order, the petition may be referred to the county commissioners.

SEC. 10. The commissioners, to whom may be referred the petition of any appellant from the decision of the selectmen or mayor and aldermen, shall consider and report upon the matters in regard to which the appeal is taken, as set forth in the petition; and the decision of the selectmen or the mayor and aldermen may be affirmed, modified, or reversed by the court, according to the report of the commissioners.

SEC. 11. If, in the case of any petition relating to such improvement, referred to the commissioners, the person to whom damages are awarded is dissatisfied with the same, he may

appear at the court when their report is returned, and object thereto in writing, and the court shall assess his damages by a jury. If he recover a greater sum, he shall be allowed his costs; otherwise, he shall pay costs.

SEC. 12. Executions may be issued for damages and costs awarded in all cases on petitions relating to such improvements, as upon judgments.

SEC. 13. This act shall take effect upon its passage.

Approved September 15, 1883.

PHYSIOLOGY AND HYGIENE IN THE COMMON SCHOOLS.

Be it enacted by the Senate and House of Representatives in General court convened:

SECTION 1. That section 4 of chapter 89 of the General Laws be and is so amended to read as follows: Teachers of common schools shall be examined in reading, spelling, writing, English grammar, arithmetic, geography, and the elements of history, and in physiology and hygiene with special reference to the effects of alcoholic drinks, stimulants, and narcotics upon the human system, and in other branches usually taught in said schools.

SEC. 2. That section 5 of chapter 89 of the General Laws be and is so amended to read as follows: The school committee may prescribe for any school, where in their judgment it shall be proper, the study of surveying, geometry, algebra, book-keeping, philosophy, chemistry, and natural history, or any of them, and other suitable studies, and teachers proposing to teach in such schools shall be examined in those branches in addition to those required of other teachers.

SEC. 3. That section 10 of chapter 89 of the General Laws be and is so amended to read as follows: The school committee may prescribe suitable rules and regulations for the attendance on, management, studies, classification, and discipline of, the schools whenever they deem the same necessary, provided that physiology and hygiene, including special reference to the effects of alcoholic stimulants and narcotics upon the human system, shall be prescribed in all schools sufficiently advanced, and said

regulations and rules being recorded by the town-clerk, and a copy thereof given to the teachers and read in the schools, shall be binding upon scholars and teachers.

SEC. 4. This act shall take effect from and after March 1, 1884.

Approved August 8, 1883.

AN ACT IN AMENDMENT OF SECTION 9, CHAPTER 111 OF THE
GENERAL LAWS, RELATING TO THE PENALTY IN CERTAIN
CASES OF NUISANCE.

*Be it enacted by the Senate and House of Representatives in
General Court convened:*

SECTION 1. That section 9 of chapter 111 be amended by striking out the word "ten" in the fifth line, and inserting the word "twenty," so that the section shall read as follows: Section 9. If any person shall place or leave, or cause to be placed or left, in or near any highway, street, alley, public place, wharf, or in any water where the current will not remove the same, any substance liable to become putrid or offensive, or injurious to the public health, he shall incur a penalty of not more than twenty dollars, to be recovered by the health officers in the name of the town; and the health officers shall remove the same.

Approved August 28, 1883.

AN ACT IN AMENDMENT OF SECTION 14, CHAPTER 78 OF THE
GENERAL LAWS, RELATING TO SIDEWALKS AND SEWERS.

*Be it enacted by the Senate and House of Representatives in
General Court convened:*

SECTION 1. Section 14 of chapter 78 of the General Laws is amended (1) by inserting after the word "towns" in the second line thereof the words "village precincts and village fire districts;" (2) by inserting in the third line of said section,

after the word "towns," the words "village precincts and village fire districts;" (3) by inserting after the word "towns" in the fifth line of said section, the words "and the selectmen of the town or towns in which such village precinct or village fire district is situated,"—so that said section as amended shall read: Sec. 14. The provisions of this chapter, or those relating to either sidewalks or sewers, shall be in force in such towns, village precincts, and village fire districts as have adopted or may adopt the same, in which case the towns, village precincts, and village fire districts shall have the same rights as cities have by virtue of this chapter; and the selectmen of such towns, and the selectmen of the town or towns in which such village precinct or village fire district is situated, shall perform all the duties and have all the powers conferred by this chapter upon the mayor and aldermen in case of cities, and the rights of all parties interested shall be settled in the same way as herein provided.

Approved September 11, 1883.

AN ACT TO PREVENT COASTING IN PUBLIC STREETS.

Be it enacted by the Senate and House of Representatives in General Court convened:

SECTION 1. No person shall coast or slide upon any sled or other vehicle on or over any sidewalk of any street, lane, or alley, nor in any highway or public street in any village or thickly settled portion of any town or city, to the danger of travellers.

SEC. 2. Any person convicted of an offence under this act shall be subject to the same penalties provided in section sixteen (16) of chapter two hundred and sixty-nine (269) of the General Laws.

SEC. 3. Any town, or the city council of any city, is hereby authorized and empowered to appropriate a sum not exceeding five hundred dollars in any year, for the purpose of providing a

suitable sliding, coasting, or skating place or places, and of controlling and keeping the same in order, under such rules and regulations as they may prescribe, said appropriation to be made at any regularly called town-meeting, notice of such proposed action having been given in the warrant for the same, or at any regular meeting of the city council of any city.

SEC. 4. All acts and parts of acts inconsistent with this act are hereby repealed.

Approved September 7, 1883.

AN ACT FOR THE PUNISHMENT OF PARENTS WHO NEGLECT TO
PROVIDE FOR THE SUPPORT OF THEIR MINOR CHILDREN.

*Be it enacted by the Senate and House of Representatives in
General Court convened:*

SECTION 1. Any parent able to earn a livelihood, who shall abandon his or her minor children under ten years of age, or shall neglect to provide for the support of the same, shall be imprisoned in the house of correction in the town or county in which said offence is committed, and for want thereof in the common jail, for a term not exceeding three months for the first offence, and for a second offence not exceeding six months.

SEC. 2. This bill shall take effect upon its passage.

Approved August 31, 1883.

AN ACT RELATING TO THE PRINTING OF THE REPORT OF THE
STATE BOARD OF HEALTH.

*Be it enacted by the Senate and House of Representatives in
General Court convened:*

SECTION 1. The secretary of the state board of health shall hereafter cause not more than twenty-five hundred copies of the report of the state board of health to be annually printed, and shall cause them to be distributed, one to each member of the

several departments of the state government, one to each senator and representative, one to the town-clerk of each town in the state for the use of the town, one to each public library, and, after reserving a sufficient number for exchange, the remainder of the edition shall be distributed at the discretion of the board to the inhabitants of the state, as nearly equitably as may be to the several towns of the state.

SEC. 2. This act shall take effect upon its passage.

Approved August 21, 1883.

AN ACT FOR THE BETTER REGISTRATION OF BIRTHS, MARRIAGES,
AND DEATHS.

Be it enacted by the Senate and House of Representatives in General Court convened :

SECTION 1. The secretary of the state board of health shall be the registrar of vital statistics for the state, and shall furnish to sextons, to clergymen, and others authorized to marry, to physicians, town-clerks, and clerks of the society of Friends, a copy of this act, and suitable blanks for recording births, marriages, and deaths, so printed, with appropriate headings, as readily to show the following facts and such others as may be deemed necessary to secure an accurate registration :

I. The record of a birth shall state its date and place of occurrence, full Christian and surname (if named), color and sex of child, whether living or stillborn, and the full Christian and surnames, color, occupation, residence, and birthplaces of parents.

II. The record of marriage shall state its date and place of occurrence, the name, residence, and official character of the person by whom solemnized, the full Christian and surnames of the parties, the age, color, occupation, and residence of each, the condition (whether single or widowed), whether first, second, or other marriage ; and the full Christian and surnames, residence, color, occupation, and birthplace of their parents.

III. The record of a death shall state its date, the full Christian and surname of the deceased, the sex, color, condition,

(whether single or married), age, occupation, place of birth, place of death, the full Christian and surnames and birthplaces of parents, and the disease or cause of death.

SEC. 2. The attending physician, accoucheur, midwife, or other person in charge, who shall attend, assist, or advise at the birth of any child, living or stillborn, within the limits of any town or city in this state, shall report to the clerk of such town, within six days thereafter, all the facts regarding such birth, as is required in section one of this act.

SEC. 3. Every person authorized to unite persons in marriage shall make a record of every marriage solemnized before him, in conformity with the requisitions prescribed for blank records of marriages in section one of this act, and shall within six days thereafter deliver, or forward to the clerk of the town in which the marriage intention was recorded, a copy of such record of marriage.

SEC. 4. Whenever any person shall die, or any stillborn child shall be brought forth in this state, the physician attending at such bringing forth, or last sickness, shall fill out and deliver to the undertaker, town-clerk, or other person superintending the burial of said deceased person, a certificate, duly signed, setting forth, as far as may be, the facts required in the record of a death, according to section one of this act; and it shall be the duty of the undertaker, or other person having charge of the burial of said deceased person, to add to said certificate the date and place of burial, and having duly signed the same, to forward it to the clerk of the town or city, and obtain a permit for burial; and in case of any contagious or infectious disease, said certificate shall be made and forwarded immediately.

SEC. 5. In the case of any deceased person not having had the attendance of a physician in his or her last sickness, the town-clerk may issue and sign the certificate of death upon presentation of such facts as may be obtained of relatives, persons in attendance upon said deceased person during said last sickness, or present at the time of death, and the permit for burial shall be issued upon such information.

SEC. 6. No interment or disinterment of the dead body of any human being, or disposition thereof in any tomb, vault, or cemetery, shall be made without a permit as aforesaid, nor other-

wise than in accordance with such permit. No undertaker or other person shall assist in, assent to, or allow any such interment or disinterment to be made until such permit has been given as aforesaid; and it shall be the duty of every undertaker or other person having charge of any burial-place as aforesaid, who shall receive such permit, to preserve and return the same to the clerk of the town within six days after the day of burial.

SEC. 7. The town-clerk may appoint suitable and proper persons, not exceeding two in number in any town, as sub-registrars, who shall be authorized to issue burial permits based upon a death certificate, as hereinbefore provided, in the same manner as is required of the town-clerk; and the said record of death upon which the permit is issued shall be forwarded to the town-clerk within six days after receiving the same, and all permits by whomsoever issued shall be returned to the town-clerk as required by section seven of this act. The appointment of sub-registrars shall be made with reference to locality, so as to best convenience the inhabitants of the town.

SEC. 8. The clerk of every town shall keep a chronological record of all births, marriages, and deaths reported to him, and shall annually, in the month of January, transmit a copy of the record of all births, marriages, and deaths occurring during the year ending December 31st next preceding such said report, to the state registrar, together with the names, residences, and official stations of all such persons as have neglected to make returns to him in relation to the subject-matters of such records, which the law required them to make.

SEC. 9. The state registrar shall cause the returns made to him in pursuance of the preceding section to be arranged, alphabetic indexes of all the names contained therein to be made, and the whole bound in convenient volumes, and carefully preserved in his office. He shall annually make and publish a general abstract and report of the returns of the preceding year in such a form as will render them of practical utility, not more than one thousand copies of which shall be printed, one copy of which shall be forwarded to every town, one copy to each senator and representative, one copy to each state and territory in the Union, and the remainder to such departments, libraries, and persons as the state registrar shall direct.

SEC. 10. The town-clerk's record of any birth, marriage, or death, or a duly certified copy thereof, shall be *prima facie* evidence of such birth, marriage, or death, in any judicial proceeding.

SEC. 11. If any person shall wilfully neglect or refuse to perform any duty imposed upon him by the provisions of this act, he shall be fined not more than one hundred dollars for each offence, for the use of the town in which the offence occurred; and it shall be the duty of the state registrar to enforce this section as far as it comes within his power.

SEC. 12. The fees of physicians for making returns of each birth and death, as herein provided, shall be the same as are now in force; and the clerk of each city and town shall be paid by such city or town, for receiving, recording, and returning the facts required to be recorded by this act, the sum of fifteen cents for each birth, marriage, and death.

SEC. 13. This act shall take effect and be in force on and after the first day of January, 1884; and all acts and parts of acts inconsistent with this act are hereby repealed.

Approved September 7, 1883.

SANITARY AUTHORITIES AND ASSOCIATIONS
IN THE
UNITED STATES OF AMERICA AND CANADA.

NATIONAL.

National Board of Health, Col. Geo. E. Waring, Jr., C. E., Secretary,
Newport, R. I.
United States Marine Hospital Service, Dr. John B. Hamilton, Surgeon
General, U. S. A., Washington, D. C.
American Public Health Association, Dr. Irving A. Watson, Secretary,
Concord, N. H.
Sanitary Council of the Mississippi Valley, Dr. John H. Rauch, Secre-
tary, Springfield, Ill.

STATE BOARDS OF HEALTH AND SECRETARIES.

Alabama—Dr. Jerome Cochran, Mobile.
Arkansas—Dr. J. A. Dibrell, Jr., Little Rock.
California—Dr. F. W. Hatch, Sacramento.
Colorado—
Connecticut—*
Delaware—Dr. William Marshall, Dover.
Georgia—Dr. V. H. Taliaferro, Atlanta.
Illinois—Dr. John H. Rauch, Springfield.
Indiana—Dr. E. S. Elder, Indianapolis.
Iowa—Dr. R. J. Farquharson, Des Moines.
Kentucky—J. H. McCormack, Bowling Green.
Louisiana—Dr. S. S. Herrick, New Orleans.
Maryland—Dr. C. W. Chancellor, Baltimore.
Massachusetts—Dr. S. W. Abbott, Wakefield.
Michigan—Dr. Henry B. Baker, Lansing.

* Vacant by reason of the recent death of Dr. C. W. Chamberlain, its former efficient secretary.

Minnesota—Dr. C. N. Hewitt, Red Wing.
Mississippi—Dr. Wirt Johnston, Jackson.
Missouri—Dr. J. C. Hearne, Hannibal.
New Hampshire—Dr. Irving A. Watson, Concord.
New Jersey—Dr. Ezra M. Hunt, Trenton.
New York—Dr. Alfred S. Carroll, Albany.
North Carolina—Dr. Thomas F. Wood, Wilmington.
Oregon—(Not yet appointed.)
Rhode Island—Dr. Charles H. Fisher, Providence.
South Carolina—Dr. Henry D. Frazer, Charleston.
Tennessee—Dr. J. Berrien Lindsley, Nashville.
Texas—Dr. R. M. Swearingen, Austin.
West Virginia—Dr. James E. Reeves, Wheeling.
Wisconsin—Dr. J. T. Reeve, Appleton.

CANADA.

Canadian Sanitary Association, F. N. Boxer, C. E., Secretary, Montreal.
Montreal, P. Q.—Dr. A. B. La Rocque, Medical Officer of Health.
Ottawa, P. Q.—Bureau of Vital Statistics.
Toronto, Ont.—Bureau of Vital Statistics.
Toronto, Ont.—Dr. P. H. Bryce, Secretary Provincial Board of Health.
Quebec, P. Q.—Bureau of Vital Statistics.
Winnipeg, Manitoba—The Minister of the Department of Agriculture, Statistics, and Health.

INDEX.

ALPHABETICAL INDEX.

[Localities in New Hampshire when not otherwise stated. Authors of papers, and not the State Board of Health, are responsible for statements in their papers.]

A

Abbott, Dr. Edward, reports from	57, 96
Actinomyces in cattle and in man	139
Acworth, typhoid fever and diphtheria in	25, 63
Air, impure, contains organisms dangerous to health	273
Aldrich, Dr. W. H., reports from.....	56, 96
Allen, Dr. C. A., reports from.....	25, 63
American Public Health Association, report of delegate.....	133
officers of.....	158
Analyses of well water.....	114-132
Andover, typhoid fever and diphtheria in	25, 63
Angell, Prof. E. R., on sanitary examination of drinking-water.....	213
reports on analyses of water	114-132
Anger, Dr. Louis L., reports from	40, 75, 102
Animals, domestic, diseases of.....	138
Annable, Dr. E. G., reports from	37, 73
Anthonie, Dr. I. G., reports from	25, 63, 124
Antrim, typhoid fever and diphtheria in.....	25, 63
Appendix, sanitary laws passed 1883.....	305
Associations, sanitary, in the United States and Canada	317
Asylum for the Insane, report on.....	182
Avery, Dr. John, address before the A. P. H. A.....	136

B

<i>Bacillus malarie</i>	141
Baldwin, Dr. W. F., reports from.....	42, 79
Barnes, Dr. W. R., reports from.....	48, 85
Barrington, typhoid fever and diphtheria in.....	25, 64
Barnstead, typhoid fever and diphtheria in.....	25, 64
Bartlett, Dr. Ezra, reports from.....	36, 72
Batchelder, Dr. A., reports from.....	53, 91
Bath, typhoid fever and diphtheria in.....	25, 64
Beekley, Dr. C. C., reports from.....	54, 93
Bedford, typhoid fever and diphtheria in.....	26, 64
Begole, Gov. J. W., address before the A. P. H. A.....	137
Belknap County almshouse, report on.....	146
Belmont, typhoid fever and diphtheria in.....	26, 64
Belfield, Dr. Wm. T., on "swell-head" in cattle.....	139

Benedict, Dr. F. L., reports from.....	55, 94
Bennington, polluted water in.....	124
Berlin Falls, typhoid fever and diphtheria in.....	26, 65
Berry, Dr. E. S., reports from.....	32, 70
Births, marriages, and deaths, state record of.....	174
in state, 1883.....	196
table showing proportion of males to females.....	197
table showing percentage of nationality.....	198
twin.....	199
table by sex, months, and counties.....	200
Bishop, Dr. J. M., reports from.....	26, 65
Black Mountain House, typhoid fever at.....	159
Blaisdell, Dr. Frank, on ensilage <i>v.</i> milk.....	170
reports from.....	38, 73
Blaisdell, Dr. Geo. C., reports from.....	43, 79
report on diphtheria.....	165
Blake, Dr. Geo. A., reports from.....	59, 99
Board of Health, State, members of.....	3
expenses of, 1883.....	211
Boynton, Dr. C. M., reports from.....	45, 84
Bradford, report from.....	65
Bradley, Dr. O. H., reports from.....	43, 80
Bread, adulteration of.....	265
Brigham, Dr. F. E., reports from.....	56, 96
Bristol, typhoid fever and diphtheria in.....	26, 65
Brookline, typhoid fever and diphtheria in.....	26, 65
Bucklin, Dr. Wm. A., reports from.....	26, 64
Burnham, Dr. A. C., reports from.....	42, 79
Burnham, Dr. H. B., reports from.....	34, 71
Burns, Dr. Robt., reports from.....	54, 94
Buswell, Dr. A. C., reports from.....	55, 71
Butler, Dr. J. N., reports from.....	45, 84, 102
Butler, Dr. John F., reports from.....	28, 66

C

Canaan, typhoid fever and diphtheria in.....	27, 66
Canaan (Vt.), typhoid fever and diphtheria in.....	28, 66
Canadian health authorities.....	818
Candia, typhoid fever and diphtheria in.....	28, 66
Canney, Dr. H. C., reports from.....	49, 86
Carbee, Dr. M. D., reports from.....	41, 78
Carr, Dr. E. L., reports from.....	54
Carr, Dr. A. F., reports from.....	38, 74
Carville, Dr. H. DeW., reports from.....	49, 87
Cattle sickness at Haverhill.....	169
Chamberlain, Dr. G. W., reports from.....	60, 100
Chandler, Dr. F., reports from.....	50, 89
Charitable institutions, general remarks.....	19
Charlestown, typhoid fever and diphtheria in.....	28, 66
Chase, Dr. Joseph, reports from.....	28, 67
Chase, Dr. Wm. D., reports from.....	54, 92
diphtheria at Peterborough.....	161
Cheese, lard, and "lardine".....	262
Chesterfield, typhoid fever and diphtheria in.....	28, 66
Children, punishment of parents who neglect.....	314
Chlorine in polluted water.....	215

Cholera infantum from acid milk.....	172
deaths from, in 1888.....	210
Cholera more destructive than war.....	136
Christie, Dr. Morris, reports from.....	25, 63
Chronic complaints from unsanitary surroundings.....	240
Claremont, typhoid fever in.....	28
Coasting, law prohibiting in public streets.....	313
Coburn, Dr. H. C., reports from.....	58, 97
Colby, Dr. Frank A., reports from.....	26, 66
Colcord, Dr. D. W., reports from.....	57, 96
Colebrook, typhoid fever and diphtheria in.....	29, 67
Concord, typhoid fever and diphtheria in.....	28, 67
Conn, Dr. G. P., reports from.....	29, 68
Connecticut, malarial fever in.....	143
Complaints to the board.....	180
Consumption, deaths from in N. H.....	207
zymotic diseases simulating.....	237
from impure drinking-water.....	240
in the cities of N. H.....	208
mortality by nationality.....	208
Contoocook, diphtheria at.....	165
Conway, typhoid fever and diphtheria in.....	30, 68
Cook, Dr. Geo., reports from.....	29, 68
Cooper, Dr. H., reports from.....	50, 88
Cobb County almshouse, report on.....	184
Corey, Dr. Chas., reports from.....	48, 86
Cornish, typhoid fever and diphtheria in.....	31, 68
Cummings, Dr. A. R., reports from.....	28
Currie, Dr. T. H., reports from.....	45, 83
Currier, Dr. D. M., reports from.....	52, 91
chronic zymotic diseases simulating consumption.....	237
Cutler, Dr. J. H., reports from.....	53, 93
Cutler, Dr. Geo. I., reports from.....	59, 98

D

Daniels, Dr. J. S., reports from.....	26, 65
Darling, Dr. Wm. W., reports from.....	52, 90
Davis, Dr. J. A., reports from.....	84, 102
Dearborn, Dr. H. G., reports from.....	51, 89
Dearborn, Dr. J. J., reports from.....	56, 96
Deaths, state record of.....	174
during the year 1883.....	204
twenty most prominent causes.....	205
Deerfield, typhoid fever and diphtheria in.....	31, 69
DeWolfe, Dr. O. C., Pullman from a state medicine point of view.....	167
Diarrhoea from acid milk.....	172
Dinsmore, Dr. W. H., reports from.....	50, 88, 119, 121
Dinsmore, Dr. S. M., reports from.....	43, 81
Diphtheria, fatality of, in N. H. in 1735.....	243
in state, 1883.....	210
treatment of.....	167
association with scarlet fever.....	168
Disease from infected milk.....	267
from bad sanitary conditions.....	237
zymotic, should be controlled.....	242
filth causes.....	158, 179

Divorces decreed during the year.....	203
from 1870 to 1883, inclusive.....	204
Dix, Dr. M. C., reports from.....	42, 79
Dodge, Dr. C. M., reports from.....	48, 86
Domestic refuse, dangerous character of.....	271
Dover, typhoid fever and diphtheria in.....	31, 69
sanitary ordinances passed in 1883.....	232
sanitary condition of school-houses.....	235
Drain pipe, sizes and varieties.....	275
Drainage, house, cardinal principles of.....	155
subsoil, of building sites important.....	274
of lands, law regarding.....	308
Dunham, Dr. W. R., reports from.....	48, 81
Durkee, Dr. F. A., reports from.....	60, 100

E

Education the cure for sanitary evils.....	21
Effingham, typhoid fever and diphtheria in.....	33, 70
Elkins, Dr. J. P., reports from.....	52, 91
Enfield, typhoid fever and diphtheria in.....	33, 71
Ensilage <i>v.</i> milk.....	170
Epping, typhoid fever and diphtheria in.....	33, 71
Epom, typhoid fever and diphtheria in.....	36, 72
Evans, Dr. S. A., reports from.....	30, 68
Exeter, typhoid fever and diphtheria in.....	36, 72
Expenses of board.....	211

F

Facts regarding sanitary work.....	213
Fairbanks, Dr. C. A., reports from.....	81, 69
Fanning, J. T. (C. E.), on homestead and suburban sewerage.....	271
Farmington, typhoid fever and diphtheria in.....	36, 72
Farrington, Dr. Jas., reports from.....	56, 96
Felt, Dr. M. H., reports from.....	42, 79, 113
Fevers, pernicious, in Italy.....	141
Fever, Texas cattle.....	138
typhoid, cause of.....	23
"cesspool".....	23
typhoid, reports, etc.....	22
Field's flush tank.....	293
Filth diseases.....	158, 179
Fisher, Dr. Thos. E., reports from.....	37, 78
Fisher, Dr. E. C., reports from.....	58, 97
Fitzwilliam, typhoid fever and diphtheria in.....	37, 73
Flagg, Dr. Geo. W., reports from.....	43, 81
Flanders, Dr. C. F., reports from.....	49, 87
Fleeman, Dr. J., reports from.....	61, 100
Flushing tank, Field's.....	292
Shone's.....	295
Folsom, Dr. N. L., reports from.....	55, 96
Food, adulteration of.....	152
Foods, canned.....	262
Food, adulteration in this and foreign countries.....	247-254
results of laws on.....	258-260
laws regarding, in the U. S.....	250

Food adulterants employed.....	260
sanitary control of in foreign countries.....	248
".....	247
Foot and mouth disease.....	169
Foster, Dr. T. S., reports from.....	44, 82
Fowler, Dr. H. B., reports from.....	27, 65
Franeestown, typhoid fever and diphtheria in.....	37, 73
Frost, Dr. C. P., reports from.....	41, 78
Frye, Dr. E. B., reports from.....	54, 93

G

Gage, Dr. Geo. N., reports from.....	60, 99
George, Dr. Chas. F., reports from.....	38, 74
Germ theory of disease in sanitation.....	11
Germany, sanitary measures in.....	234
Gibson, Dr. F. N., reports from.....	52, 90
C. R., reports from.....	61, 101
Gihon, Dr. Albert L., on vital statistics as sanitary monitors.....	155
Gilmanton, typhoid fever and diphtheria in.....	38, 73
Gilsum, typhoid fever and diphtheria in.....	38, 73
Gleason, Dr. A. R., reports from.....	37, 73
Glucose.....	262
Goffstown, typhoid fever and diphtheria in.....	38, 73
Goodall, Hon. D. H., on ensilage and milk.....	173
Goodhue, Dr. D. P., reports from.....	58, 97
Goshen, typhoid fever and diphtheria in.....	38, 74
Gould, Dr. Chas. R., reports from.....	59, 98
H. D., reports from.....	51, 89
T. M., reports from.....	55, 95
Gove, Dr. Geo. S., reports from.....	60, 100
Grafton Co. almshouse, report on.....	184
Grant, Dr. Wm. H., reports from.....	58, 91
L. E., reports from.....	28, 66
Grantham, typhoid fever and diphtheria in.....	38, 74
Grease trap (cut).....	279, 287
Great Falls, typhoid fever and diphtheria in.....	40, 75
Greeks, physical training among.....	144
Greenville, typhoid fever and diphtheria in.....	41, 74
Greenfield, typhoid fever and diphtheria in.....	41, 74
Greenland, typhoid fever and diphtheria in.....	40, 75

H

Hall, Dr. A. C., reports from.....	56, 96
Lucinda S., reports from.....	68
Ham, Dr. John R., reports from.....	32, 70
Hampton, typhoid fever and diphtheria in.....	41, 78
Hanover, typhoid fever and diphtheria in.....	41, 75
Hanson, Dr. C. W., reports from.....	53, 91
Hardy, Dr. W. O., reports from.....	61, 101
Harmon, Dr. M. A., reports from.....	53, 91
Hatch, Dr. Geo. W., reports from.....	61, 100, 129
Haverhill, typhoid fever and diphtheria in.....	41, 79
cattle sickness in.....	169
Health administration in the U. S.....	135
authorities in the U. S. and Canada.....	317
Heating of school-rooms.....	149

Henniker, typhoid fever and diphtheria in.....	42, 47
Hering, Rudolph (C. E.), on house-drainage.....	155
Hill, Dr. G. C., reports from.....	44, 80
typhoid fever and diphtheria in.....	42, 79
Hillsborough, typhoid fever and diphtheria in.....	42, 79
polluted water (wells).....	113
Hinsdale, typhoid fever and diphtheria in.....	42, 79
Historical value of vital statistics.....	175
Holbrook, Dr. Guy, reports from.....	29, 67, 102
Hollister, Dr. H. H., reports from.....	25, 64
Homestead and suburban sewage.....	271
Hopkinton, typhoid fever and diphtheria in.....	43, 79
Horsch, Dr. C. H., reports from.....	31, 69
on sanitary work.....	231
Hoamer, Dr. Wm. H., reports from.....	53, 91
House sanitation.....	155, 156
Hubbard, Dr. E. T., reports from.....	48, 86
Hudson, typhoid fever and diphtheria in.....	43, 80
Hunt, Dr. E. M., address before the A. P. H. A.....	134
Geo. W., reports from.....	31, 68
Hutchinson, Dr. H. S., reports from.....	38, 73
Hygiene in our schools.....	13, 311
school.....	148
school-house.....	177
homestall.....	271

I

Ice v. impurities of water.....	178
Index to record of births, marriages, and deaths.....	175
Insane asylum, report on.....	182
Institutions, public and charitable.....	182
Institutes, teachers'.....	176

J

Jaffrey, typhoid fever and diphtheria in.....	43, 80
Jenkins, Dr. A., reports from.....	57, 97
Jones, Dr. D. W., reports from.....	55, 94
F. P., reports from.....	38, 74
F., reports from.....	52, 90
F. W., reports from.....	51, 90
Junkins, Dr. Wm. O., reports from.....	40, 75

K

Keene, typhoid fever and diphtheria in.....	43, 80
sewerage of.....	189
Kelley, Dr. C. K., reports from.....	54, 94
Kimball, Dr. J. R., reports from.....	58, 97
Kingston, diphtheria at, in 1735.....	243
typhoid fever and diphtheria in.....	44, 81

L

Laconia, typhoid fever and diphtheria in.....	44, 82
Lake Village (Gillford), typhoid fever and diphtheria in.....	44, 83
Lancaster, typhoid fever and diphtheria in.....	45, 83
Land, law regarding drainage of.....	308

Larabee, Dr. G. H., reports from.....	58, 97
Langdon, typhoid fever and diphtheria in.....	44, 83
"Lard cheese" and "lardine".....	262
Lathrop, Dr. M. C., reports from.....	33, 69
Laws, not adequate to secure sanitary protection.....	154
special on adulteration of food.....	254
Lead poisoning.....	120, 125, 129
Leavitt, Dr. J. M., reports from.....	33, 70
Lebanon, typhoid fever and diphtheria in.....	45, 83
Leeds, Prof. Albert R., on adulteration of food.....	152
Leet, Dr. Geo. E., reports from.....	27, 66
Lempster, typhoid fever and diphtheria in.....	45, 84
Lessons of experience and observation.....	12
Library of the board.....	181
Lindsley, Prof. C. A., views on typhoid fever.....	28
Lisbon, typhoid fever and diphtheria in.....	45, 84
Littleton, typhoid fever and diphtheria in.....	46, 84
Little Boar's Head, polluted well.....	132
Locke, Dr. D. L., reports from.....	36, 72
Londonderry, typhoid fever and diphtheria in.....	48, 85
Loveland, Dr. I. G., reports from.....	38, 73
Lufkin, Dr. C. M., reports from.....	44, 83
Lundy, Prof. C. J., on school hygiene.....	148
Lynan, Dr. G. H., on typhoid at Campton.....	160
Lyme, typhoid fever and diphtheria in.....	48, 85

M

Mack, Dr. W. B., reports from.....	56, 96
Madison, typhoid fever and diphtheria in.....	48, 86
Malaria.....	140
in New Hampshire.....	101
biological factors in.....	142
from foul water on ship board.....	143
in New England.....	142
in Connecticut.....	143
Malarial micro-organisms.....	141
Manahan, Dr. Valentine, reports from.....	33, 71
Manchester, typhoid fever and diphtheria in.....	48, 86
Marlow, typhoid fever and diphtheria in.....	49, 85
Marlborough, typhoid fever and diphtheria in.....	49, 88
Marriages, state record of.....	174
during the year.....	201
Martin, Dr. Geo. A., reports from.....	45, 84
Mayo, Dr. J. H., reports from.....	54, 92, 164
McDaniel, Dr. Daniel, reports from.....	25, 64
McGregor, Dr. Geo. W., reports from.....	46, 85
J. L., reports from.....	60, 100
Meat supply: inspection necessary.....	268
Medical colleges.....	231
Medicine not wholly a money-making profession.....	136
Members of board.....	3
Merriden, typhoid fever and diphtheria in.....	50, 88
Merriam, Dr. N. H., reports from.....	49, 88
Merrill, Dr. S. A., reports from.....	26, 64
Wm T., reports from.....	41, 78
R. E., reports from.....	60, 99

Merrimack, typhoid fever and diphtheria in.....	50, 88
Microscopical organisms in impure air.....	273
Milford, typhoid fever and diphtheria in.....	50, 88
polluted well in.....	121
Milk, inspection and sale regulated by law.....	17, 305
<i>v.</i> ensilage.....	170
dangerous character of certain qualities.....	266
protection against adulteration in New Jersey.....	254
Milton, typhoid fever and diphtheria in.....	50, 88
Morality <i>v.</i> uncleanness.....	22
Morey, Dr. G. B., reports from.....	49, 87
Morfett, Dr. F. T., reports from.....	47, 85
Mont Vernon, typhoid fever and diphtheria in.....	50, 89
Moorar, Dr. J. W., reports from.....	48, 87
Morrison, Dr. Geo. H., reports from.....	60, 100
Morse, Dr. F. H., reports from.....	52, 90
C. A., reports from.....	51, 90
Munsey, Dr. Geo. F., reports from.....	41, 74
Myopia, a disease of the educated.....	150
percentages among school children.....	150
how to prevent.....	151

N

Narcotics, effect of, to be taught in the schools.....	311
Nashua, typhoid fever and diphtheria in.....	51, 89
National health authorities.....	317
Nationality in consumption.....	208
Nervous system, diseases of.....	211
Newton, Dr. Wm. K., on sanitary control of the food supply.....	152, 247
New Boston, typhoid fever and diphtheria in.....	51, 89
New Ipswich, typhoid fever and diphtheria in.....	51, 90
New Jersey, against adulteration of food.....	252
New London, typhoid fever and diphtheria in.....	52, 91
Newmarket, typhoid fever and diphtheria in.....	51, 89
Newport, typhoid fever and diphtheria in.....	52, 90
Newton, typhoid fever and diphtheria in.....	52, 90
New York, against adulteration of food.....	252
Norris, Dr. C. C., reports from.....	29, 66, 102
Northwood, typhoid fever and diphtheria in.....	53, 91
Nuisances, penalty in certain cases.....	312
Nute, Dr. Wm. H., reports from.....	25, 64

O

Ober, Dr. Chas. F., reports from.....	53, 93, 162
Odell, Dr. J. W., reports from.....	75
Oldright, Dr. Wm., on ventilation of sewers.....	156
Oleomargarine.....	261
Ossipee, typhoid fever and diphtheria in.....	53, 91

P

Page, Dr. B. F., reports from.....	47, 85, 108
Parents, penalty for neglect of children.....	314
Parker, Dr. D. T., reports from.....	36, 73
Parker, Dr. H. R., reports from.....	31, 69
Parsons, Dr. J. W., reports from.....	55, 94

Partridge, Dr. S. H., reports from.....	41, 74
Patterson, Hon. J. W., teachers' institutes.....	176
Peabody, Dr. L. W., reports from.....	42, 79
Peaslee, Dr. B. D., reports from.....	66
Perkins, Dr. F. B., reports from.....	38, 74
Perkins, Dr. M., reports from.....	49, 85
Perry, Dr. Wm. G., reports from.....	36, 72
Pelham, typhoid fever and diphtheria in.....	53, 91
Penacook, typhoid fever and diphtheria in.....	53, 91
Pengra, Dr. C. P., on purification of water by freezing.....	178
Penn, Dr. J. W., on malarial fever.....	144
Peterborough, typhoid fever and diphtheria in.....	53, 92, 161
Pestilence, a sanitary measure.....	135
Phthisis, deaths from.....	207
Physicians' gratuitous advice.....	133
Physical training.....	144
Physiology and hygiene in the schools.....	13, 811
text-books on.....	15
Pierce, Dr. Geo. W., reports from.....	61, 101
on diphtheria in N. H. in 1735.....	248
Pillsbury, Dr. W. W., reports from.....	50, 88
Pittsfield, typhoid fever in.....	54
Pipe, drain, laying of.....	198
Plainfield, typhoid fever and diphtheria in.....	54, 93
Plalstow, typhoid fever and diphtheria in.....	54, 93
Plymouth, typhoid fever and diphtheria in.....	54, 93
polluted water (wells).....	181
Pneumonia during 1883.....	209
Porter, Dr. W. H., reports from.....	58, 97
Porter, Dr. W. B., reports from.....	60, 99
Portsmouth, typhoid fever and diphtheria in.....	55, 94
Powers, Dr. G. H., reports from.....	43, 80
Pray, Dr. J. W., reports from.....	53, 91
Pray, Dr. T. J. W., reports from.....	32, 69
Prefatory note.....	5
Preservatives, character of.....	264
Prison, state, report on.....	183
Public and charitable institutions.....	182
general remarks on.....	19

R

Rain-fall, volume of, for given depths of rain per acre.....	282
Randall, Dr. Daniel F., reports from.....	28, 66
Raymond, typhoid fever and diphtheria in.....	55, 95
Raymond, Dr. J. H., on house sanitation.....	156
Registration law.....	16, 315
report, summary of.....	196
Reeves, Dr. Jas. E., on general sanitation.....	153
Report, general, of board.....	7
of the secretary.....	21
Reports, first and second of board exhausted.....	181
how distributed.....	314
Reynolds, Dr. Thos. O., report from.....	44, 81
Richardson, Dr. A. P., report from.....	59, 99
Rindge, typhoid fever and diphtheria in.....	56, 94

Rochester, typhoid fever and diphtheria in	56, 96
Rogers, Dr. T., reports from	55, 93
Rollinsford, typhoid fever and diphtheria in	56, 96
Romans, physical training among the	144
Rowe, Dr. F. H., reports from	28, 64
Rumney, typhoid fever and diphtheria in	56, 96
Russell, Dr. Julia W., reports from	29, 68
Ryan, Dr. Hillary, on Texas cattle fever	138

S

Sallsbury, typhoid fever and diphtheria in	56, 96
Salmon, Dr. D. E., on Texas cattle fever	138
Salmon Falls, typhoid fever and diphtheria in	56, 96
Sanborn, Drs. T. B. and C. A., reports from	52, 91
Sanbornton, typhoid fever and diphtheria in	56, 96
Sanger, Dr. T. E., reports from	46, 84
Sanitation of houses	155
Sanitary authorities in the U. S. and Canada	319
laws passed in 1888	306
control of the food supply	247
examination of drinking-water	213
work, facts regarding	231
science	153
progress in state	8
general progress in	9
work, how best accomplished	7
Sargent, Prof. D. A., on physical training	144
Scarlet fever, deaths from	211
School-houses at Dover	235
Scott, Dr. N. H., reports from	61, 101
Scruton, Dr. J. E., reports from	59, 98
Seabrook, typhoid fever and diphtheria in	57, 96
Secretary's report	21
Sewage, disposal of	296
volume of, per person	276
excretal, character of	276
Sewerage, homestead and suburban	271
of the city of Keene	189
Sewer systems, proportions of	299
trench excavations, table of	290
Sewers, overhead ventilation of	156
slopes of	293
elements of egg-shaped	292
friction of	292
brick-work of	291
slope and velocity of contents	283
capacity of, formulas for determining	281
financial influences on	300
construction by selectmen in certain cases	312
details of	294
man-holes in	294
village	296
Sewer pipes, sizes and kinds	275, 277
price list of	289
capacity for storm water (egg-shaped)	288
(round)	286

Sewer pipes, capacity of (table).....	285
quality of.....	286
elements of (table).....	280
Sex in consumption.....	208
Shone's flush-tank.....	285
Short-sightedness among school children.....	150
how to prevent.....	151
Sidewalks, constructed by selectmen in certain cases.....	312
Sleeper, Dr. H., reports from.....	54, 88
Slop-hopper (cut).....	278
Smart, Dr. Chas., on malaria.....	143
Smith & Chamberlain, M. Ds., reports from.....	31, 69
Dr. D. O., reports from.....	43, 80
Wm. T., reports from.....	41, 75
M. F., reports from.....	36, 72
A. W., reports from.....	50, 88
Jos. R., observations on Texas cattle.....	139
Smiley, Dr. J. R., reports from.....	59, 98
Soils, how polluted, and dangers arising therefrom.....	273
Somersworth, typhoid fever and diphtheria in.....	57, 97
Spaulding, Dr. F. W., reports from.....	33, 71
Spooner, Dr. Frank, reports from.....	45, 83
Springfield, typhoid fever and diphtheria in.....	58, 97
Squibb, Dr. E. R., on adulteration laws.....	253, 256
Stanley, Lord, on sanitary studies.....	153
State prison, report on.....	133
sanitary progress in.....	8
Sternberg, Dr. Geo. M., on malaria.....	140
Stimulants, effects of, to be taught in the schools.....	311
Stillings, Dr. F. A., reports from.....	29, 67
Stone, Dr. M. T., reports from.....	59, 98
Strafford, typhoid fever and diphtheria in.....	58, 97
Students, athletic sports among.....	146
Starrevant, Dr. C. B., reports from.....	87
Sugar, grape.....	262
Sullivan, Dr. W. B., reports from.....	33, 69
Sunapee, typhoid fever and diphtheria in.....	58, 97
Suncook, typhoid fever and diphtheria in.....	58, 97
Surry, typhoid fever and diphtheria in.....	58, 97
Swanzy, typhoid fever and diphtheria in.....	59, 98
"Swell-head" in cattle.....	139
Swift, Dr., on typho-malarial fever from shallow lands.....	148

T

Tank, Field's flushing.....	293
Shone's flushing.....	295
Taylor, Dr. S. A., reports from.....	38, 73
Teachers' Institutes.....	176
Teachers v. physiology and hygiene.....	15
Temple, polluted water in.....	126
Tests for impure water needed.....	242
Tile drain-pipes.....	275
drainage with sewer.....	193
Tilton, typhoid fever and diphtheria in.....	59, 98
Towle, Dr. C. H., reports from.....	31, 69
Towne, Dr. Geo. D., reports from.....	49, 87

Trap, grease (cuts).....	279, 287
Troy, typhoid fever and diphtheria in.....	59, 98
Tucker, Dr. E. M., reports from.....	27, 66
Twitchell, Dr. Geo. B., reports from.....	43, 80
Twombly, Dr. N. C., reports from.....	58, 97
Typhoid fever	22, 23
reports on, from towns.....	25
at the Black Mountain House.....	179
in state in 1883.....	209
Typhus fever in New York.....	13

U

Union, typhoid fever and diphtheria in.....	59, 98
---	--------

V

Vaccination, A. P. H. A., report on.....	158
saving of life by	9, 13
Vaughan, Dr. V. C., on purification of water by freezing.....	178
Ventilation of school-rooms.....	149
Village sewers.....	296
Vital statistics.....	155

W

Walpole, typhoid fever and diphtheria in.....	59, 99
Wallace, Dr. W. F., reports from.....	50, 89
Ward, Dr. Artemas, reports from.....	28, 66
Waring's system of sewerage in Keene.....	190
Warren, typhoid fever and diphtheria in.....	60, 99
Washington, typhoid fever and diphtheria in.....	60, 99
Wason, Dr. Eugene, reports from.....	48, 85
Water, drinking, sanitary examination of.....	213
surface, in sewerage.....	277
indication from odor.....	214
analysis.....	213
sugar test.....	215
chlorine in.....	215
ammonia in.....	218
nitrates and nitrites in.....	220
lead and iron in.....	228
tests for lead.....	224
iron.....	225
organic matter.....	226
carriage of sewage.....	177
polluted at Little Boar's Head.....	182
Plymouth.....	131
Hillsborough.....	114
Milford.....	120
Bennington.....	124
Temple.....	126
Wilton.....	127
good well of, at Wilmot.....	118
poisoned by lead.....	120, 125, 129
polluted, and typhoid fever.....	113
dangerous wells.....	108
bad, results of.....	111

Water drainage from farm buildings.....	108
physicians should determine purity of.....	112
drinking, examination of.....	107
pollution, general remarks.....	18
Watson, Prof. J. M., on physical training.....	144
Dr. H. L., reports from.....	46, 85, 103
H. A., reports from.....	42, 79
Daniel, reports from.....	31, 68

Y

Yellow fever more destructive than war.....	136
Young, Dr. Stephen, reports from.....	56, 96
John, reports from	36, 72

Z

Zymotic diseases.....	17
simulating consumption	237



LANE MEDICAL LIBRARY

To avoid fine, this book should be returned
on or before the date last stamped below.

--	--	--



